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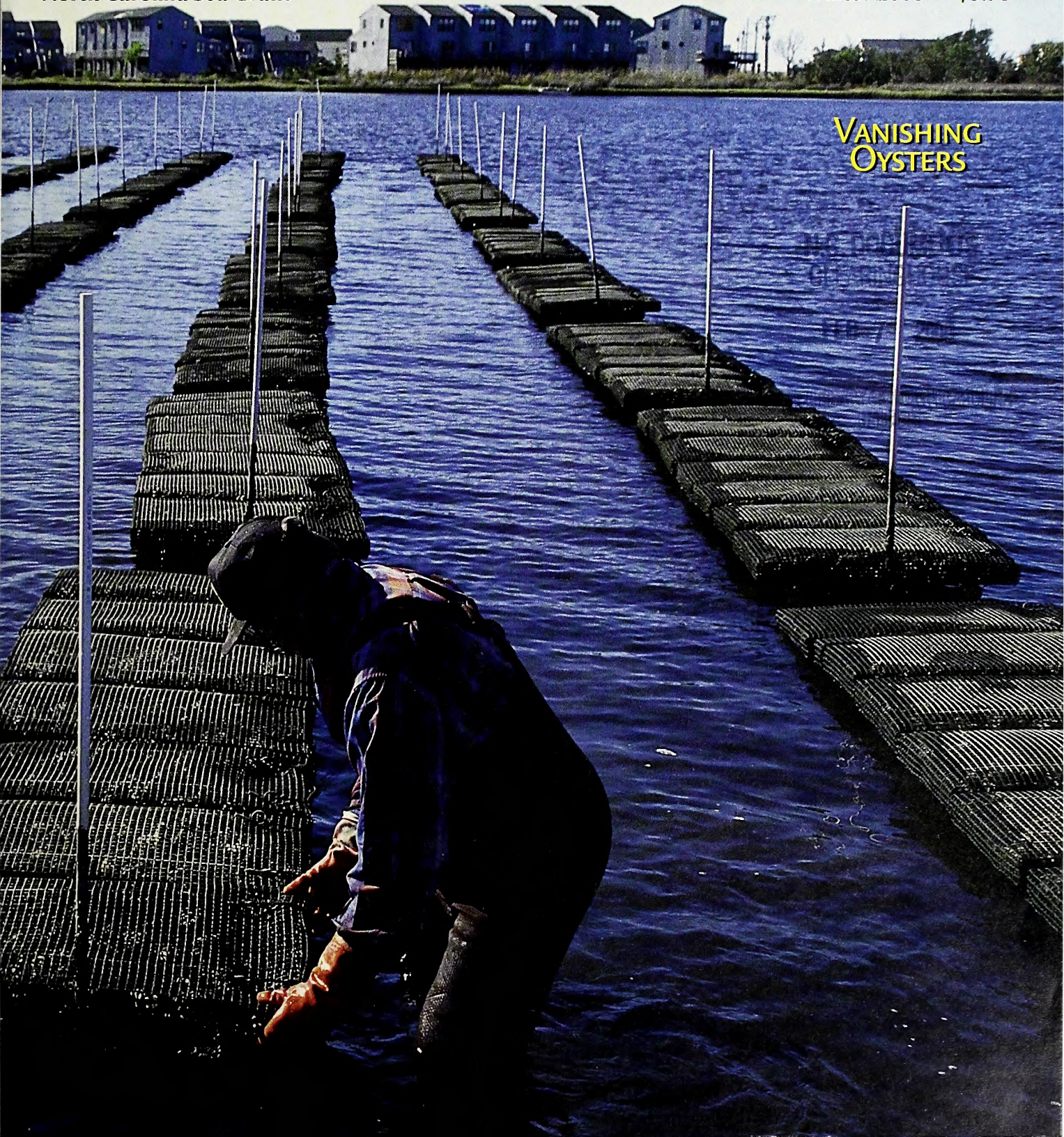
Chicamacomico Lifesaving Station • Sailors' Snug Harbor • Coyote vs. Wolf

Coastwatch

North Carolina Sea Grant

Winter 2000 • \$3.75

VANISHING
OYSTERS



Y2K Odyssey

Finally, it is here. The Year 2000.

What will the new year bring for coastal North Carolina? How about the new decade, century or millennium?

I am more prone to observe the present or reflect upon the past, rather than to predict the future. But there is one prediction I can assure. Change.

The last few months of 1999 were full of change. Hurricanes Dennis, Floyd and Irene hit the state in quick succession. Floyd's floodwaters in particular took a tremendous toll.

As inland communities like Tarboro and Kinston work to rebuild this year, North Carolina Sea Grant scientists will continue to evaluate the impact of floodwaters mixing in the sounds, estuaries and coastal ocean waters.

While Hurricane Floyd overshadowed Dennis, there were some changes associated with the earlier storm. For example, Dennis' extended stay along the North Carolina coast postponed the relighting of the Cape Hatteras lighthouse.

The beacon had been scheduled to resume during a ceremony over the Labor Day weekend. Instead the switch was turned Nov. 13. The lighthouse was moved last summer, away from the encroaching waves of the Atlantic Ocean.

Some folks will argue the lighthouse will never be the same in its new setting in a maritime forest. But others were thankful for the move, as thousands came out for the relighting ceremony.

Speaking of Hatteras Island, some had feared that Dennis cut a new inlet through the island. Those concerns were quelled as geologists explained the damage to N.C. 12 was from overwash, and a new section of highway was quickly built.

But farther south, along the Core Banks, Hurricane Dennis did offer a prime example of the dynamic combination of storms and inlets. The storm cut a new inlet in the vicinity of the Old Drum Inlet — and not far from Drum Inlet dredged by the Army Corps of Engineers in recent years.

That area is low and prone to overwash, and has seen various inlets through the centuries, explains William J. Cleary. A geologist at the University of North Carolina at Wilmington, Cleary is co-author of *Shifting Shorelines: A Pictorial Atlas of North Carolina Inlets*, which

Herman Lankford



was featured in the last issue of *Coastwatch*.

Cleary says only time will tell if the new inlet will stabilize and deepen. If it does, it could be at the expense of the Corps-created inlet nearby.

In this, our first issue in 2000, we note a change ourselves. Senior editor Renée Wolcott Shannon has joined the NC State University Alumni Office, but she left behind several stories. We will miss Renee's strong writing, friendly smile and artistic flair.

We ask you to share our welcome to Pam Smith, who joins us from NC State News Services. Pam grew up on Long Island's Great South Bay — and she is eager to return her focus to coastal issues. In fact, she says it is like coming home.

In this issue, we take time to look back at the U.S. Lifesaving Service as the Chicamacomico Historical Association sponsors the historical preservation of the first of a series of lifesaving stations built on the Outer Banks in 1874.

The preservation efforts, led by Ken Wenberg, include not only the unique architectural aspects of the buildings, but also the recovery of long-forgotten records of the early days of the lifesaving service and the brave surfmen and superintendents. Later this year, we hope to look at more recent changes in the Lifesaving Service's descendant, the U.S. Coast Guard.

Ann Green takes a step back in time as she visits with retired merchant marines at The Sailors' Snug Harbor in Sea Level. These sailors may live on solid ground these days, but their hearts and spirits are still tied to the sea.

Ann also looks at the past and the future of oyster harvests in North Carolina — from traditional harvesters whose efforts have been hampered by pollution and disease, to aquaculturists who are looking to revive the state's oyster market.

And we share the stories of an educator, who encourages a new generation of potential marine scientists, and of biologists working to keep the red wolf as a distinct species. If the winter winds are keeping you inside, we offer a selection of adventure books to keep your attention.

Welcome to 2000: A Coastal Odyssey.

Katie Mosher, Managing Editor

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Coastwatch

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Stocks are Declining in North Carolina

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Coastwatch

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The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 12-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina. *Coastwatch* (ISSN 1068-784X) is published bimonthly, six times a year, for \$15 by the North Carolina Sea Grant College Program, North Carolina State University, Box 8605, Raleigh, North Carolina 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: kmosher@unity.ncsu.edu.

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Front cover photo of aquaculture oyster beds and table of contents photo of traditional tonging for oysters by Scott D. Taylor.

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COASTAL TIDINGS

NC State Faculty Honored with Scholarship

Retired NC State University faculty members Frank and Rachel Thomas have been honored with an undergraduate scholarship endowment at the university.

The Frank Bancroft and Rachel Kirby (Kinlaw) Thomas Food Science and Family and Consumer Scholarship will provide support to undergraduate students studying food science or nutrition. Priority will be given to students from areas where seafood and freshwater fisheries are important.

The scholarship endowment was announced recently at the 5th Joint Meeting of the Atlantic Fisheries Technology Conference and Tropical and Subtropical Seafood Science and Technology Society of the Americas' banquet in Atlantic Beach.

Frank Thomas, chair of the North Carolina Sea Grant Outreach Advisory Board, began his career at NC State in 1958 as an assistant professor in food science and a food processing extension specialist. While working at the university, Thomas developed the Coastal Seafood Processing Program and facilities that later became the NC State Seafood Lab. The program, together with one proposed by East Carolina University, formed the North Carolina Sea



Rachel and Frank Thomas

Erica Balmer

Grant marine extension program.

After retiring, Thomas helped secure legislative funding to construct the NC State University Center for Marine Sciences and Technology (CMAST) in Morehead City.

A Sea Grant field office also will be located in this facility, expected to be completed in May.

Rachel Thomas worked in the N.C. Cooperative Extension Service from 1951 until her retirement in 1989. As an extension agent, she initiated the "Best Food Buys" Teletip (telephone) service that ran bi-monthly for 10 years. She also developed statewide educational programs to help families improve their nutritional status and make the most of their food dollars.

After her retirement from NC State, she developed special food and nutrition products for the extension service.

Contributions are being accepted to help build the endowment. Make checks payable to the Frank B. and Rachel Thomas Endowment, and send to N.C. Agricultural Foundation, NC State, Box 7645, Raleigh, NC 27695-7645. For additional information, send e-mail inquiries to Dave_Green@ncsu.edu or call 252/726-7341. — A.G.

In the Next Issue of *Coastwatch*

When North Carolina's dogwoods bloom, the first shad and herring can't be far behind, swimming up the rivers to spawn. For centuries, fishing communities along the Cape Fear, Neuse, Roanoke and Chowan Rivers have depended on these anadromous fish for food and profit. Join Renée Wolcott Shannon as she explores the past, present and uncertain future of this once-lucrative fishery. In addition, fossils will reveal stories of coastal North Carolina's past, thanks to a sneak preview of the new North Carolina Museum of Natural Sciences. Walk with Pam Smith along a prehistoric time line to discover the prevalent flora and fauna.

UNC-W Scientists to Study Coral Reefs

Tourists exploring the coral reefs that ring the U.S. Virgin Islands discover an underwater scene rich beyond their imagination. The reefs support some 4,000 species of fish and 800 species of coral.

The bad news is that scientists fear the coral reefs and other marine ecosystems in the region are degrading significantly and are in critical need of research.

The good news is the University of North Carolina at Wilmington will lead a team of universities at a proposed \$2 million Joint Institute for Caribbean Marine Studies in the U.S. Virgin Islands. Researchers will focus on the health of Caribbean coral reefs and related educational and economic opportunities for the region.

Plans for the institute, a joint effort of the U.S. Department of the Interior and the U.S. Department of Commerce/National Oceanic and Atmospheric Administration

(NOAA), were announced at the U.S. Coral Reef Task Force fall meeting.

The proposed facility would be on the site of the former West Indies Laboratory, destroyed by Hurricane Hugo in 1989. The plan's wish list calls for research laboratories, classrooms, a lecture hall, teaching aquarium, boats and diving equipment, distance-learning equipment, and housing for students, scientists and visitors. UNC-W will administer programs at the institute in collaboration with the University of the Virgin Islands, the University of South Carolina and Rutgers, the state university of New Jersey.

The consortium will help UNC-W, which has a coral reef program in the Florida Keys, extend its research into the Caribbean.

UNC-W marine scientists are involved with a number of North Carolina Sea Grant and NOAA-supported programs. — P.S.

Two Scholars Win Jones Awards

Two North Carolina Sea Grant scholars have received the Excellence in Coastal and Marine Graduate Study Award as part of the Walter B. Jones Memorial and NOAA Excellence Awards for Coastal and Ocean Resource Management.

In honor of the late Rep. Walter B. Jones Sr., NOAA recognizes individuals and organizations for contributions in helping the nation maintain healthy coastal and ocean environments.

Catherine Wannamaker of Raleigh and David Robinette of Fuquay-Varina received the awards in Washington, D.C.

Wannamaker is completing a John A. Knauss marine policy fellowship with the Senate Committee on Commerce, Science and



Catherine Wannamaker



David Robinette

Transportation. The fellowship, which is based in Washington, is sponsored by the National Sea Grant Program.

Last December, Wannamaker received a master of science degree from North Carolina State University. Wannamaker's thesis focused on the "Effects of Hypoxia on Movements and Behavior of Estuarine Species."

Robinette is a National Research Council Fellow at the U.S. Environmental Protection Agency. In May, he received a Ph.D in comparative biomedical sciences from NC State.

Robinette's thesis focused on the molecular immunology of nonspecific defenses in fish. During this research, which was funded by Sea Grant, he found a class of antibiotics in fish that had not been identified before. — A.G.

High School Teams to Compete in Bowl

High school teams competing in the N.C. Ocean Science Bowl on Feb. 26 will be out to unseat two-time champions from Williams High School in Burlington. Some 20 teams from across the state are expected to take part in the third annual regional event at North Carolina State University's McKimmon Center.

The Ocean Science Bowl was inaugurated in 1998, The Year of the Ocean, as a way to re-energize precollege educational programs in the marine sciences.

The 2000 state championship team will receive scholarships from NC State's College of Physical and Mathematical Sciences. They also advance to the National Ocean Science Bowl Tournament in Washington, D.C., in April.

The N.C. Ocean Science Bowl is coordinated by the Consortium for Oceanographic Research and Education (CORE), which includes NC State, East Carolina University, the University of North Carolina at Wilmington and the University of North Carolina at Chapel Hill. Support also comes from North Carolina Sea Grant, the UNC Math and Science Education Network and Centers, the N.C. Coastal Federation and NC State's Science House.

More information is available on the World Wide Web at: www.meas.ncsu.edu/ncosb. Science teachers interested in future Ocean Bowl activities should contact Carrie Thomas by e-mail at cjthomas@unity.ncsu.edu. — P.S.



Sea Grant Celebrates 30th Anniversary

Over the past 30 years, North Carolina has witnessed unprecedented growth, particularly in the coastal region.

This development has brought economic opportunities and stress on our natural resources.

Since 1970, North Carolina Sea Grant has led research on the state's coastal resources — from nonpoint source water pollution to the blue crab. The extension staff also provides programs and services — from guiding teachers on marsh hikes to informing fishers about new technology.

The program began with an institution grant in 1970. With the establishment of the University of North Carolina system in 1972 and involvement of Duke University via a consortium, North Carolina began the nation's 12th Sea Grant College in 1976.

"Sea Grant's mission is to develop and disseminate information to promote the wise use of our state's coastal resources," says Ron Hodson, Sea Grant director.

"Through research and outreach efforts over the last 30 years, we have seen a growing awareness and appreciation of Sea Grant's contributions to North Carolina's interests among important constituencies throughout the state. Sea Grant's role in North Carolina will grow in importance in the future as additional pressures are placed on coastal resources." — A. G.

Researchers Target Ghost Pot Losses

Ghost pots — crab pots untended because their markers have been accidentally severed — are scaring away blue crab profits and threatening stocks. Severed from their float lines by boat props, trawl gear, storm surges or other mishaps, tens of thousands of unmarked and untended pots keep catching crabs, most of which will perish.

Now marine fisheries researchers, supported by a Fishery Resource Grant, are working with a Pamlico County crab pot maker to test devices using biodegradable materials to provide an escape route for crabs and finfish. Biodegradable modifications to lost pots could be mandated when the blue crab fishery management plan is updated.

Blue crabs are the state's most valuable commercial species, worth more than \$40 million in 1998. By most estimates, there are 800,000 to one million crab pots in the state waters, and crabbers lose an average of 10 percent of their pots during a season. Studies in North Carolina and in Louisiana have shown a minimum of 11 to 25 crabs die in each ghost pot per season.

With up to 100,000 pots lost a year, the numbers are substantial, says Division of Marine Fisheries biologist Sean McKenna, who works out of Beaufort County. "In my mind, the ghost pots issue is one of the most important in the crab fishery," he says.

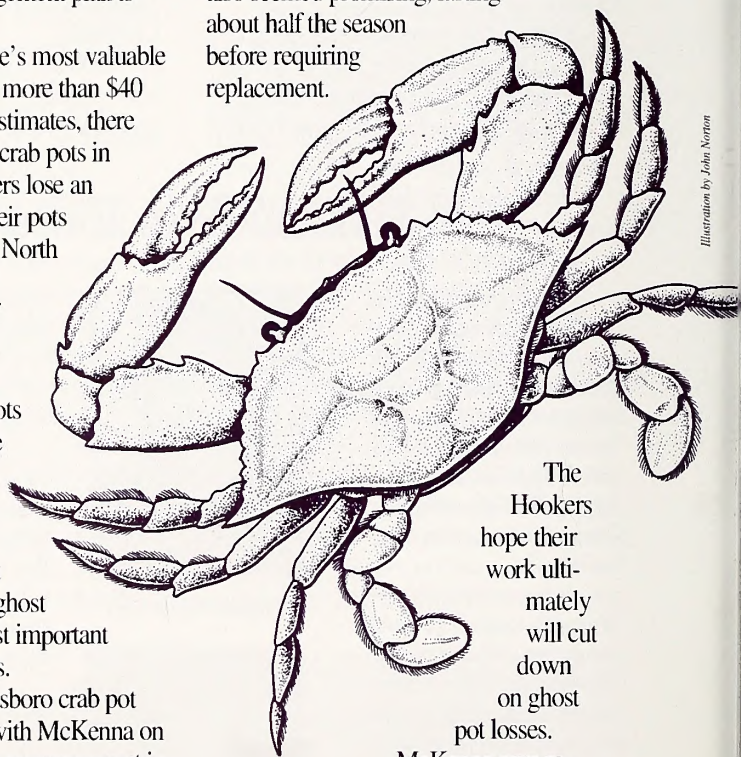
Irene Hooker, a Grantsboro crab pot maker, has been working with McKenna on a solution since receiving a resource grant in 1994. She built the pots while Kelly Hooker, her daughter and research assistant, did the field work.

The Hookers recruited a dozen full-time commercial crabbers to test three designs — panels, cullings attached with both hog rings and with string, and a standard hook and bungee cord, attached

with string instead of hog rings. Six types of string were used in the devices — jute, medium-weight cotton, heavy-duty cotton, cotton chalk line, cotton cable cord and medium-weight sisal. The pots were tested in a variety of locations to allow for differences in water chemistry.

The crabbers who participated did so because they recognize the need for a solution to the substantial ghost pot losses of blue crabs and commercial finfish.

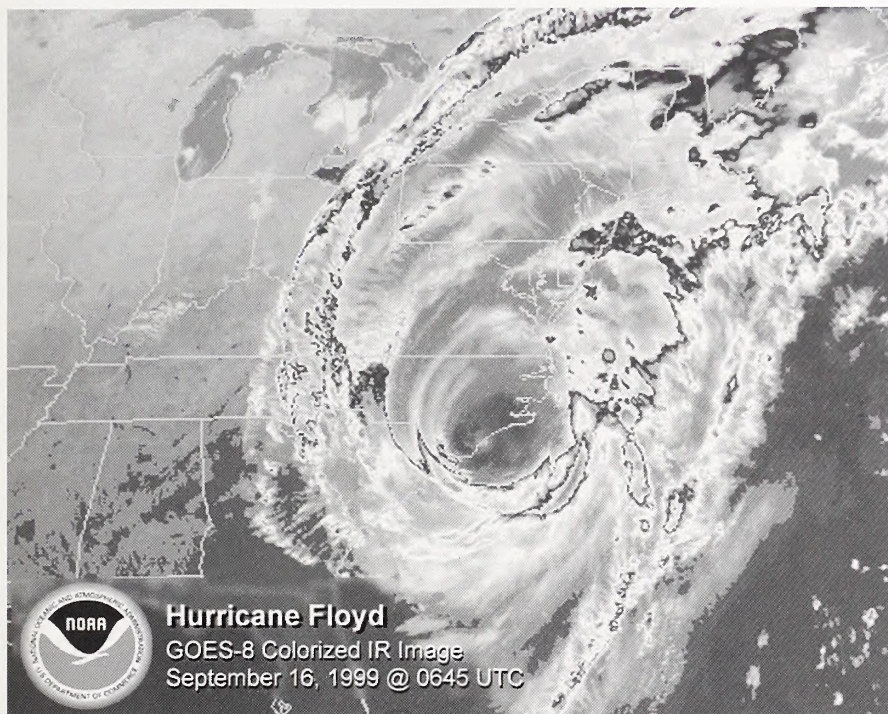
According to the final project report in 1996, the crabbers chose the panel as their favorite device. Most thought cotton to be the most suitable of the twine tested, lasting almost the entire season. Heavy-duty cotton also seemed promising, lasting about half the season before requiring replacement.



The Hookers hope their work ultimately will cut down on ghost pot losses.

McKenna says researchers are following up on the Hookers' findings, working to perfect the panel design and some of the other mechanisms that could effectively address the issue. "We want to get something that will do what it's supposed to do without inconvenience to the fishermen, or costing them a lot of lost catch," he says. — J.A.P.

COASTAL TIDINGS



NOAA's Beaufort Lab Marks 100 Years of Service

Hurricanes delayed, but could not deter, plans to mark the NOAA Beaufort Laboratory's 100 years of history in — and service to — the conservation of our nation's living marine resources.

November events, including a scientific conference, a study day for area students, and an open house for the general public, drew several hundred visitors to the National Oceanic and Atmospheric Administration's Center for Coastal Fisheries and Marine Habitat Research at Beaufort. Better known as NOAA's Beaufort Laboratory, the facility is the second oldest marine research laboratory, and one of several collectively known as the National Centers for Coastal Ocean Science.

Dan Hoss, interim director, along with researchers and staff, hosted middle and high school students, who delighted in the display of reef fish and a live tank exhibit.

An open house gave interested citizens a rare look inside the laboratory

and a chance to talk with staffers about the past and present research on coastal environment.

One of the earliest achievements, Hoss notes, was a forerunner of modern aquaculture practices. Just after World War I, the culinary demand for the diamond back terrapin led to overfishing — and drastic population reductions. Scientists at the Beaufort Laboratory began an experiment to raise the sought after culinary treat.

Recent achievements include protecting sea grasses and enhancing the understanding of the life cycles of estuarine-dependent fish.

In 2000, Hoss says, scientists will study the effects of the state's historic 1999 hurricanes. They will continue to provide the scientific information to help shape coastal resource management policies. More information is available on the Web at: <http://shrimp.bea.nmfs.gov/labpage.html>.

—P.S.

Winter Waterfowl Show

If you're heading for a winter weekend get-away at the coast, you won't be alone. So will thousands of waterfowl escaping blasts of Arctic air. National Wildlife Refuge Centers at Pea Island and Alligator River offer prime viewing and photo-taking opportunities.

The Outer Banks habitats provide resting and feeding points for migrating waterfowl and an array of bird species. The feathery show usually continues through March, or until the first hint of the season's change calls them home.

Though guided tours or formal refuge programs won't be offered again until spring, helpful information is available at each visitors center to ensure safe, self-guided trail walks or drives.

The area is a popular, off-season destination for wildlife lovers, in part, because of nature-based festivals, such as the annual Wings over Water festival held in early November. During the most recent festival, some 185 species of birds were spotted. The event drew about 300 participants and pumped more than \$200,000 into the local economy.

Many of the unusual birds spotted by Wings enthusiasts have since continued their southern migration. Others are likely to take advantage of the abundant food source and remain along with great numbers of waterfowl.

Information about the Pea Island and Alligator River Centers is on the Internet at: www.fws.gov. Follow the links to the Southeast site.

— P.S.

The Vanishing Oyster:

*Stocks Are Declining
in North Carolina*

By Ann Green • Photos by Scott D. Taylor

While the tide is low on the Newport River, Garry Culpepper trudges through muddy water to a large oyster rock on a nearby shore.

Dressed in black boots and gloves, Culpepper bends over and picks up a large oyster shell. "This is a rock oyster," he says. "It is nicely round and fat. This is what you used to find all around the Newport River."

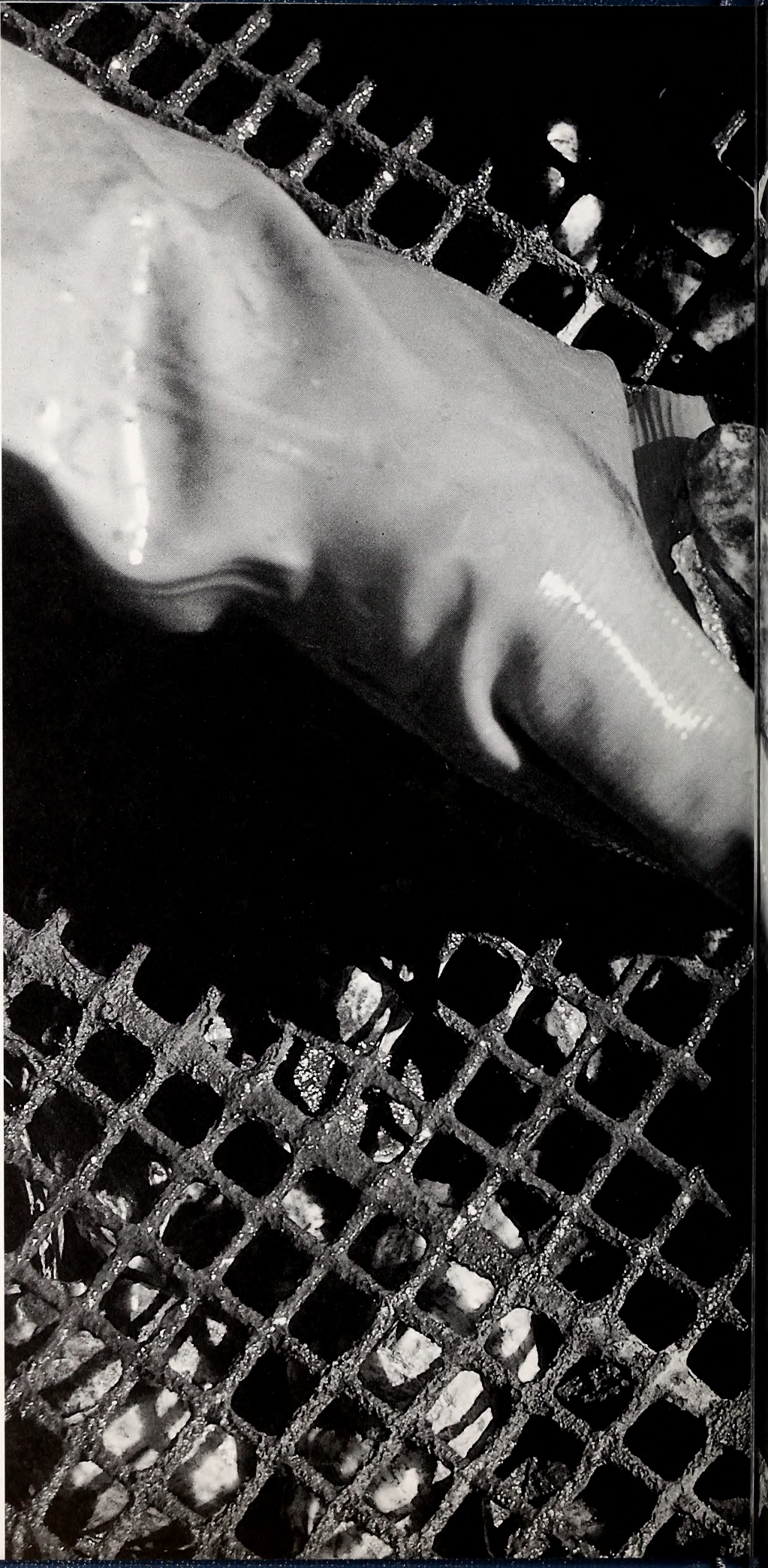
Now Culpepper — one of the last hand-harvesters of oysters left in the state — has to settle for a small coon oyster that is thinner and less meaty than the rock oyster.

"I don't work this shore," he says. "I go to more productive areas. You would probably work this area hard and only get one bushel. Since we lost the Cross Rock in the Newport River, we have been forced to work the river near the ocean inlet and settle for coons. It is not a high-grade oyster." The rock was closed to harvesting because of pollution.

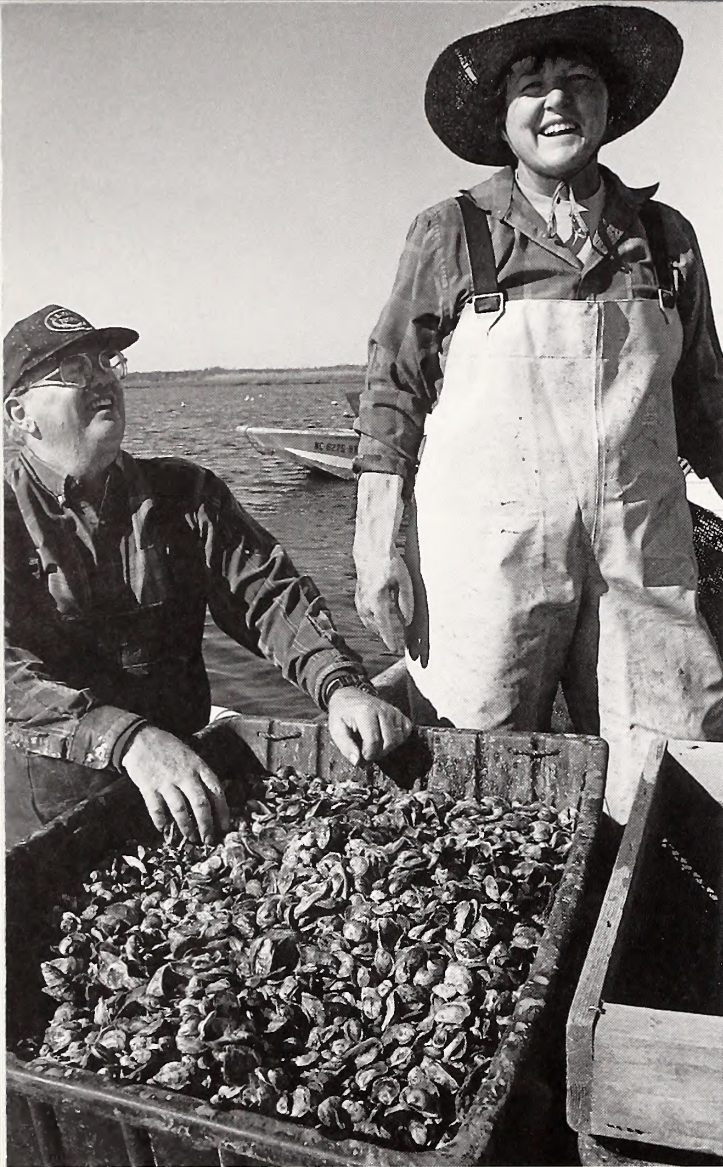
While Culpepper is laboring in the river, many of his neighbors are steaming oysters on a gas grill for the Mill Creek Oyster Festival. For the past 26 years, the festival has celebrated the delectable oysters harvested on the Newport River. Each year, people flock to the festival to get bowls of steaming clam chowder and plates full of fried seafood and steamed oysters.

There's only one problem: the oysters don't even come from the Newport River.

C o n t i n u e d







Jim and Bonnie Swartzenberg gather oysters in Stump Sound.

"These oysters are from Mississippi," says David Knox, the festival organizer. "We have been getting oysters out of state for eight years. We get about 200 bushels for the festival. It is hard to get anyone around here to guarantee that many oysters."

The vanishing oysters on the Newport River is a familiar scenario in other North Carolina rivers and creeks — from Harlowe Creek in Carteret County to Lockwood Folly River in Brunswick County.

At the turn of the century, North Carolina produced almost two million bushels of oysters a year. By the 1920s and 1930s, annual production had declined to about 300,000 bushels. In 1998, 44,613 bushels of oysters were harvested in North Carolina compared to 225,000 bushels in 1987, according to the N.C. Division of Marine Fisheries (DMF).

"From 1900 to 1945, overharvesting and harvesting methods had a lot to do with the decline of the oyster industry," says Mike Marshall, DMF central district manager. "After 1988, Dermo (a naturally occurring parasite) has greatly affected the oyster industry. In between, there has been a lot of habitat loss and water quality has been affected."

To address the oyster crisis, the N.C. Blue Ribbon Advisory Council on Oysters was initiated in 1992. The recommendations included more support for mariculture or fish farming. North Carolina Sea Grant has been on the forefront of educating fishers

about mariculture techniques.

The council also addressed protecting and restoring oyster habitats, improving coastal water quality and developing disease-resistant strains.

Though few of the recommendations have been implemented, they are being considered by the DMF for the long-term oyster management plan. The Fisheries Reform Act of 1997 mandates that the state establish management plans for oysters and other major fisheries.

"The plan will be finished in October 2000," says Marshall. "One of the most important parts of the plan is managing oysters around diseases. Another controversial issue is using non-native species in North Carolina waters."

The public information document, which came out in September, recommends stock assessment of oysters.

The state has good data on commercial harvesting of oysters, according to Marshall. "However, we are not going to get an accurate picture of oyster harvesting data until we get a program in place for recreational harvesting. It is particularly important in the southern part of the state. Anybody, including those who live outside the state, can take a bushel of oysters per day for consumption during the open harvest season."

Marshall says fishers also voice concerns about the state's leasing programs. North Carolina has 295 shellfish bottom leases for oysters and clams covering 2,204 acres, according to the DMF. About 500,000 acres are suitable for cultivation.

The two top oyster-producing states in 1998 — Louisiana and Washington — have culture or lease systems. Louisiana has 403,000 acres in private leases. Washington allows a non-native species, *Crassostrea gigas*, to be cultured on private leases, significantly increasing production. Connecticut, which ranked fifth in overall production in 1998, has 30,146 acres leased for shellfish.

Even though leaseholders in North Carolina have posted signs in the water, the state doesn't offer much protection against poachers.

Jim and Bonnie Swartzenberg, who have several leases scattered across Stump Sound near Topsail Island, have had problems with recreational fishers using their beds.

"Some people get the idea that everything is free," says Jim Swartzenberg, who owns J&B AquaFood in Jacksonville. "They don't care about our leases. They think they can wade out and help themselves to our oysters."

As the state develops its management plan, Culpepper and other fishers have numerous ideas on reviving the industry.

"For oysters to be productive and come back in North Carolina, you can't rely on Mother Nature," says Culpepper. "I would like to see the state do more seed planting. The Division of Marine Fisheries is loaded with biologists who could spawn oysters and transplant the seeds."

Oyster Valuable to State

The American oyster (*Crassostrea virginica*), which can survive the often harsh and constantly changing conditions found in North Carolina's rivers and sounds, has an important place in the state's estuaries. Healthy oysters serve as a natural water-filtration system by cleansing estuaries of suspended materials, taking up excess nuisance algae and promoting growth of vegetation.

They also create a productive habitat for aquatic life, including blue crabs, shrimp, speckled sea trout, drum and rockfish, and serve as a stabilizing force in the estuaries' sediments.

"The health of North Carolina's oyster population is a good indicator of the overall health of our estuaries, and all prudent measures should be taken to ensure a viable oyster resource," the N.C. Blue Ribbon Council report states.

Since before recorded history, the oyster has been an important source of food in coastal areas. When the first Europeans arrived, they were amazed at the number of oysters found.

The Carolina oyster industry hit its ascent in 1880s when Baltimore companies built large canneries in coastal towns. Schooners from outside the state crowded the state's oyster beds. They overwhelmed the industry and introduced oyster dredges and longer, sturdier tongs into the local oyster industry. Despite later attempts to restrict dredging, most of the damage to oyster beds already had occurred by 1910.

The state's oyster stock began declining from its peak around the turn of the century to today's low harvests. For years, many families along the coast made a living from oystering and shrimping.

In North Carolina, the oyster is found from the extreme southern end of the Albemarle Sound southward through the state's sounds and estuaries to the South Carolina border. The most productive counties are Carteret and Onslow.

Bill Rice, 87, remembers when 100 families around Stump Sound made a living from hand harvesting or tonging for oysters.

"When I came here in the '40s,

everybody who lived here all caught oysters for a living," says Rice. "If someone got sick, everyone else would help to pay the doctor's bill."

Back then, he says, each person had his own private area for harvesting oysters. "You would catch 10 to 17 bushels a day. You didn't poach on other people. Everybody was happy in the oyster business."

Now, Rice and his family are the only Stump Sound fishers left in the oyster business.

During the oyster season, Rice and his wife Bernice get up at sunrise when the water is clear to get in their skiff and tong for oysters. They often accompany their daughter Bonnie Swartzenberg and her husband Jim in the sound. Bonnie and her mother use tongs to fill their baskets while Bill and Jim nub the clusters and cull out the dead shell and undersized oysters.

"Bonnie's mother is the champion of tonging," says Jim Swartzenberg. "Bonnie and her mother can outdo me."

Rice says that oysters have made a big difference in his life. "Of my seven children, two have Ph.D.s, three have master's degrees and two others have bachelor's degrees. Harvesting oysters (along with farming) gave me added money."

In the 1960s, ecological changes began affecting oyster harvests. Insidious intrusions — disease and polluted waters,

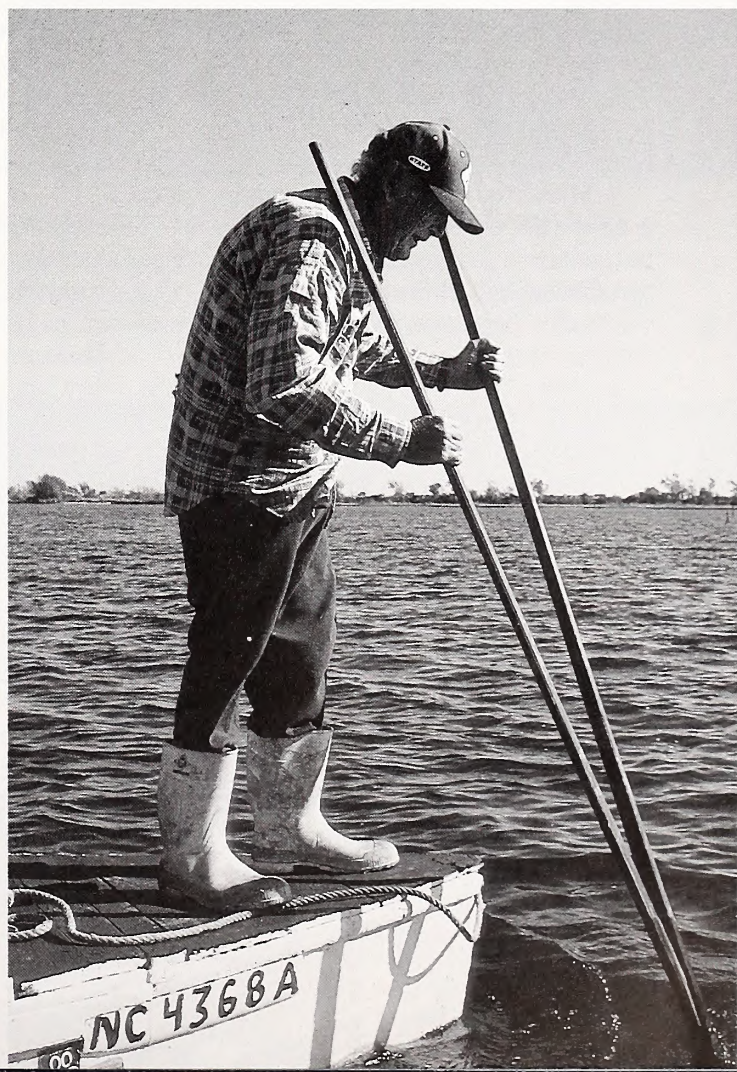
combined with poor management and overexploitation by the oyster fisher — have tainted this once prolific resource.

Since the late 1980s, Dermo has been responsible for major oyster kills in North Carolina. Harmless to humans, the parasite wears down oysters over many months and kills them before they reach a harvestable size.

"The most damage in North Carolina from Dermo has been on the Pamlico Sound where conditions are conducive to the proliferation of parasites," says Marshall. "Typically, a high salinity in the water and above average temperatures allow the parasite to reproduce in high numbers. If you look back over the last 100 years, 90 percent of the oysters landed in North Carolina have come from the Pamlico Sound."

Over the past years, there also have

Continued



Bill Rice tongs for oysters in Stump Sound.

been isolated incidents of MSX — a parasite that typically thrives in cooler waters north of North Carolina.

A combination of factors has forced the closing of many oyster beds. Of 1.43 million acres of North Carolina salt water suitable for shellfishing, more than 56,000 acres of shellfish-growing waters are permanently closed, according to a DMF report. This represents an increase of about 380 acres since 1998.

Most normally open areas from Carteret County southward also experience temporary closures during excessive rains. They are reopened for shellfishing once water samplings indicate bacteria levels are safe.

Outside Gene and Lillie Oglesby's Mill Creek home on the Newport River, the state has closed a large man-made oyster rock dubbed "Shell Road" because of the large number of oyster shells.

"I have eaten many an oyster from Shell Road," says Lillie Oglesby. "Now the whole river is polluted from Newport to Lawton Bay."

Oglesby's daughter, Elaine Crittenston, vividly remembers the day when the state closed one of her dad's prime oyster gardens.

"My dad had tended the oyster garden in the area that was closed," she says. "He had nowhere to go to get clean oysters. I remember seeing tears in my dad's eyes."

Not too long after that, Gene Oglesby

retired from oystering.

"It got to the place where there was nothing out there," he says. "You would work all day and would have done good if you caught a bushel."

To provide more oysters, the state initiated an Oyster Relay Program. Fishers are paid to bring shellfish from polluted waters back into clean waters. There the oysters purify themselves before being harvested the next season. Leaseholders also are allowed to move these oysters to their beds at no cost.

From April to mid-May, the Swartzenbergs and Rices load up their boat with small cluster oysters from state-managed beds in polluted waters.

"We take up about 60 bushels of clusters of oysters at a time and then relay them to our leases," says Swartzenberg.

With the decline of the oyster business, shucking houses also vanished. Today, there are no shucking houses operating in Mill Creek. The last one closed in 1985. The vacated building "stands alone on the river as a reminder of the ways things used to be," says Garry Culpepper's mother, Johnise. "When I was growing up, there were five shucking houses in Mill Creek. My dad had one house."

She remembers when Hurricane Hazel roared through Mill Creek on Oct. 15, 1954, and damaged the shucking houses.

"Many of the houses were hurt bad," says Johnise Culpepper. "But my dad's own house had minor damage. Others in the community pitched in to fix his house. Instead of nine people shucking oysters, he had 20 workers because so many people were out of work and needed the money."

Aquaculture is Wave of Future

To increase oyster production, some fishers are turning to aquaculture. The methods for culturing oysters vary — from growing oysters in racks in the water to new seeding methods. The traditional method of oyster culture is the planting of cultch material (shells, etc.) to provide a clean, firm space for the attachment of natural larvae.

"The future of the oyster industry is in mariculture," says North Carolina Sea Grant mariculture specialist Skip Kemp. "In order to harvest, you need to put seed in the water. Harvesting from the wild relies on natural seed, which is limited."

Sea Grant and Tipper Tie, Inc., a metal clip manufacturing company in Apex, developed an innovative method of culturing oysters off the bottom with a grow-out system that resembles a floating ladder. Now a few oyster growers in the state use this method to grow shellfish.

Swartzenberg was one of the first to try this chub method and received a state Fisheries Resource Grant to determine its economic feasibility.

He also uses racks to grow oysters. In a leased area of Stump Sound, he has more than 800 cages strapped to racks. Each cage holds about a half bushel of oysters.

Eating salty, delectable oysters is a tradition at the Mill Creek Oyster Festival.



"Racks fare better in storms than chubs," he says. "A whole set of chubs flipped over during Hurricane Fran, but the racks have withstood the ravages of the past four hurricanes."

Both methods of growing oysters lead to a "fuller and cleaner oyster and more money," says Swartzenberg. "That is not to say you don't get a clean oyster from the bottom. But for cultured oysters, you get a better price."

Although cultured oysters bring a higher price, he says it is more labor intensive than growing oysters on the bottom. "When you have oysters on the bottom, you don't have to move them during a storm. The bottom line though is that the cultured oysters are more of a sure thing. The bottom oysters are more apt to die from disease."

Mark and Penny Hooper of Hooper Family Seafood in Smyrna receive 20 percent of their income from mariculture.

They have experimented with the cage-and-rack and chub methods to grow oysters. In recent years, they have received Fishery Resource Grants to test the methods.

"I have found that the method doesn't matter," says Mark Hooper. "The seed determines how successful the oyster crop is. We get our seed from hatcheries — brood stock. Some perform better than others."

Hooper has a lofty goal: producing the perfect oyster. "I would like to produce a single oyster of similar size. It needs to be rounded and deep. If I was able to produce a nicer oyster, I could sell it to upscale restaurants in the Triangle."

Leslie Lee of Sloop Point Seafood on Topsail Sound is testing new ways to seed oysters. He spats the oysters from seeds in bags or shelves. Then he lays them on top of a screen on a muddy bottom.

"We are just getting into it," says Lee. "They are looking great, but I have only been doing it for a year."

Oyster Research Under Way

While aquaculture techniques are being used on oysters, research is under way in North Carolina to test methods to enhance

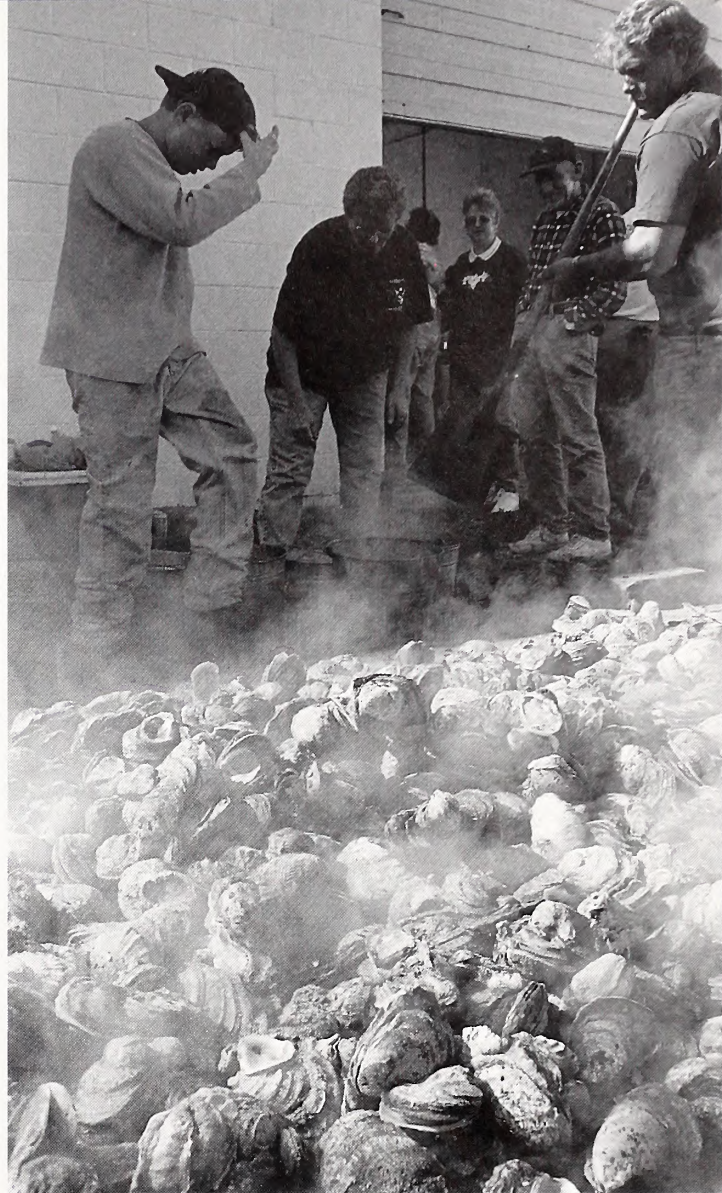
management of native oysters and the aquaculture potential of non-native oysters.

Charles Peterson of the University of North Carolina at Chapel Hill's Institute of Marine Sciences is studying the structure and hydrology of oyster reefs — critical areas for oyster production. For example, by manipulating the profile of oyster reefs, water or current flow may be sped up, possibly helping these filter feeders grow faster and avoid disease.

"We are looking at how oyster gear and dredging has damaged oyster reefs," says Peterson, a North Carolina Sea Grant researcher. "We have looked at alternative techniques for harvesting oysters and addressed oyster growth and mortality. We have found that oyster growth and survival improved by installing larger reefs than traditionally have been constructed by the Division of Marine Fisheries."

Recently, Peterson received a \$200,000 grant from the state to test the aquaculture performance of non-native oysters in North Carolina waters. At least two of the species are naturally resistant to Dermo and other diseases that plague the state's native oyster.

Research on oyster disease also has gained momentum in recent years. At Rutgers University in New Jersey, oyster breeding programs have resulted in stocks resistant to both Dermo and MSX. These stocks have been evaluated in growth and survival trials in the Delaware and Chesapeake bays, but none of the stock has



Oysters are roasted on a gas grill at the Mill Creek Festival.

been tested in North Carolina waters.

"This area is pretty much wide open to research," says Ami E. Wilbur, assistant professor of biology at the University of North Carolina at Wilmington. "North Carolina needs to generate its own disease-resistant stocks to combat its particular problems with the health of local oyster populations."

Wilbur sees great potential in the state for more research on selectively bred oysters for consumption and restoration.

"North Carolina has the waterways to support a lot of oyster culture, and considerable interest in restoring previously productive areas," says Wilbur. "It is exciting to be a new professor in the state because there is a lot of opportunity to get involved in a variety of different projects." ■





TREASURES OF CHICAMACOMICO:

Architectural Gem Yields Rich Historical Bounty

By Katie Mosher • Photos by Michael Halminksi

Mention shipwrecks and treasures along the North Carolina coast, and most folks think of gold coins or ship's cannons.

But near Rodanthe, one treasure has more to do with the lives saved in shipwrecks off Cape Hatteras than with the bounty lost to the sea.

Built in 1874, a simple yet elegant wooden building has been considered a storage barn for most of this century. It sits in the shadow of a larger lifesaving station that operated from 1911 until 1954.

The larger building has drawn thousands of tourists since it opened as a museum in 1982. But as renovations continued on the site, preservationists realized the former boat shed was in fact, the hidden treasure.

"This is going to be the centerpiece," says Michael Halminksi, former president of the Chicamacomico Historical Association as he walks through the building that stands 43 feet long, 19 feet wide, with a two-story boat area, living space and a third story for storage.

"It was the first of seven lifesaving stations put on the Outer Banks," he says of the complex of buildings that carries the Native American name for the area.

Ken Wenberg says the restoration is a one-man project. "I work by myself. There is only one restorer," he says. "But I get a lot of advice — for free," he adds with a chuckle.

A skilled craftsman, Wenberg stays true to the original construction style, using wooden pegs rather than metal nails in the building's frame.

But the site's treasures are not limited to the building. Wenberg also is keen to preserve the stories of the architect and the lifesaving crews — including ancestors of his wife, Jackie.

Continued

TOP:

John Allen Midgett is pictured some years after the *Mirlo* rescue.

BOTTOM:

The lifesavers who participated in the *Mirlo* rescue are presented American Grand Crosses of Honor in Manteo, July 23, 1930.



N.C. Archives and History



N.C. Archives and History

This research takes him well beyond his woodwright skills. To find the original records of the Outer Banks stations, he shows the tenacity of a gumshoe detective and the enthusiasm of a revival preacher.

While he works alone inside the building, Wenberg uses faxes, the Internet and e-mail to enlist the aid of dozens of professional and amateur historians and archivists to track the records. Working from homes and offices, they spend countless hours scouring libraries and archives to solve mysteries of the missing maritime records.

Their combined success goes beyond the history of this single Outer Banks landmark. They are providing missing pieces in the legacy of the U.S. Lifesaving Service and other federal agencies in the 1800s.

"Go back in the National Archives or the Library of Congress, you will find virtually nothing," Wenberg says. "You can find lots of things after 1915."

EARLY LIFESAVERS

Before the U.S. Coast Guard, there was the U.S. Lifesaving Service. Wenberg's research goes back even further to the Revenue Cutter Service and local humane societies that rescued the crews of ships lost along the dangerous shoals near the Outer Banks.

In the late 1840s, the federal government agreed to form a lifesaving service, "but it never got off the ground," Wenberg explains. For the first two decades, the service's activities were focused in New York, New Jersey and the Great Lakes.

The Civil War left the efforts stalled, but by 1871, there were 71 "red houses," also known as houses of refuge. The plain buildings looked more like barns than stations.

In the 1870s, as shipping activity along the North Carolina coast increased, Sumner Kimball was given the helm of the U.S. Lifesaving Service. New stations were ordered along the East Coast, including areas along the Outer Banks that already were earning the title "Graveyard of the Atlantic."

The 1874 plans offered a building much more detailed than a barn. Eventually, they were used for about two dozen stations along the East Coast. Seven were along North Carolina's Outer Banks — Chicamacomico, Little Kinnakeet, Bodie Island, Nags Head, Kitty Hawk, Caffey's Inlet and Currituck Beach, also known as Jones Hill.

Before he started the Chicamacomico station, builder James Boyle had worked on a station in Little Kinnakeet, also on Hatteras Island. "The marine revenue cutter inspector made him tear it down because it did not conform to the military plans," Wenberg explains. "There were multiple sets of plans floating around."

Boyle was discharged before the Kinnakeet station was rebuilt as a variation of the Chicamacomico design. That building now belongs to the National Park Service, but it has not had the attention of its sister station.

Over the years, the other 1874 design stations have met a variety of fates. One was lost to the roaring sea. Several became private residences or offices.

The Kitty Hawk station has been moved twice and now sits across the road as the Black Pelican restaurant. The building has its own footnote in history — it is where the Wright Brothers came to send a telegram announcing their first flight.

And the building, which now has an addition, may have a ghost. “I have seen a wine glass move two feet down the bar,” says Tommy Matthews, general manager of the restaurant.

The original Caffey’s Inlet station, built in 1874, burned. But its replacement, built in 1899, still stands in its original location in Duck. Now it serves as the restaurant at the Sanderling Inn.

A TOWN’S LIFEBLOOD

For generations, the Chicamacomico facilities were the heart of the community. Town leaders were those who made lifesaving their career, such as Zion S. Midgett, who was in the service for 30 years.

“He had five sons, four were in the Coast Guard,” says his granddaughter, Jackie Wenberg. “Most everybody was in the Coast Guard.”

In particular, the Chicamacomico lifesavers were known for daring rescues. In 1891, they were credited with saving seven members of the *Strathairly*, which had been lost in wind, fog and high surf. In 1898, they rescued the crew of the schooner *Fessenden*.

In 1899, they were able to save the entire crew of the *Mini Bergen* by using the Lyle gun and “breeches buoys.”

“If the surf was dangerously high or the vessel wrecked close to shore, a Lyle gun was used,” explains a history prepared by the Chicamacomico association.

The gun was actually a bronze cannon mounted on a wooden carriage. It could fire a projectile and line 450 yards. “The surfmen on shore fired the projectile over the wreck, where the crew secured it to the wreck,” the report adds. Once the crew was able to secure a rope, known as a hawser, the rescue could begin.

“Undereath the hawser rode the rescue device known as the breeches buoy, a life ring with trouser legs. One victim at a time could be pulled ashore in the breeches buoy by the rescuers on the beach.”

Such rescues are recreated on Thursdays throughout the summer as members of the historical association demonstrate the lifesaving drills. The rescues are a delight to tourists, who also view artifacts including a ship’s door, a life car, uniforms and the boat used in the station’s most famous rescue — the *Mirlo* in 1918.

Legends honor the surfmen who, led by Captain John Allen Midgett, saved the 42 members of the *Mirlo*, a British tanker that had hit a World War I German mine.

The rescue, which came in the face of fire and turbulent seas, brought honors from the British and United States governments. “They received the American Grand Cross of Honor — six of the 11 ever presented,” Ken Wenberg says.

When Jackie Wenberg was young, the focus of the Chicamacomico station was the shingled building built in 1911. “When I was a child, this building was the boathouse out on the beach,” she says of the original station.

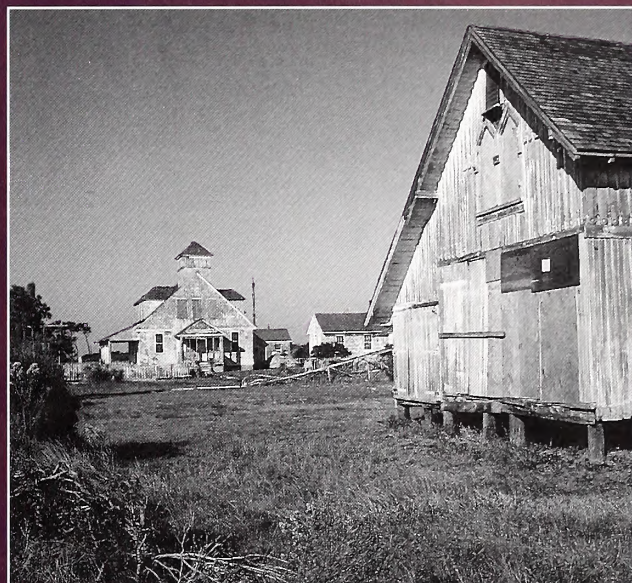
Continued

TOP:

This east view of the old station in 1983 also shows the 1911 station.

BOTTOM:

Restoration work progresses.



TOP:

Ken Wenberg fits gable end bracket.

BOTTOM:

Architectural detail comes to life on the west end.



ARCHITECTURAL QUESTIONS

The 1874 building has been moved several times — as its original location would now be about 1,800 feet into the ocean waters. The building is now about three-quarters of a mile south and 2,900 feet west of the original site, with its grand doors offering quick access to the sea.

Many of the more ornate aspects had been removed and destroyed. The eave supports were protected when a shed was added in 1889. “Nobody had looked above the shed ceiling since 1889,” Ken Wenberg says.

Once the eave supports were found, Wenberg could see the original paint color. “To a restorer, this is like Christmas,” he says.

Tracing the history of the station’s design and construction has been a challenge for Wenberg, who points to the eaves, which originally had ornate trim that had been long forgotten.

“This raised an entirely new set of questions: Who is the architect and why is it so ornate?” he says.

After more than 200 hours of research, Wenberg tracked down the original plans for the building. They had been saved almost by accident when a U.S. Coast Guard historian from Charleston pulled them aside when files were being cleaned out.

“These eight pages are the entire verbiage for the labor and materials for this building,” Wenberg says.

“I can’t believe they would throw these things away,” Halminski adds.

The architect, Frances W. Chandler, was a graduate of the Paris Architectural Institute. He toured Europe, sketching favorite buildings from gothic and renaissance styles.

“What we feel he did was that he took what was in his heart — the things that he had sketched in Europe — and put the composite into a building,” Wenberg says.

After nearly 250 more hours, and with the assistance of 57 other people, Wenberg tracked down Chandler’s sketchbooks in the personal library of E.I. DuPont. “People got excited. Here we have something extremely unusual,” he says.

“This is the only one of the first 23 still intact,” Wenberg says. “When we get this done, it will be one of a kind.”

The same design was used for the original stations that dotted the coast from Cross Island, Maine, to the Outer Banks, but most have had remodeling and additions.

In Chandler’s sketchbooks, Wenberg found designs repeated in the Chicamacomico building, such as windows from a church in northwest France that was built in the 1500s.

What really clinched it for Wenberg was the drawing of a medieval building in Cannes, France, that was built in 1032. The board-and-batten style with gothic windows was just the same. “Bang — it jumps out at you,” he says.

Although other construction styles were available in the 1870s, the building features a post-and-lintel style. “Everything is pegged with wooden pegs — not a nail in the frame,” Wenberg says.

"This building was knocked around by storms, off its foundation three times, and moved several times, but remained intact," he adds. "The internal construction style dates to medieval times."

MISSING RECORDS

Wenberg is fascinated not only by the architecture and craftsmanship in the building, but also by the history of the lifesaving crews. As he and others spent hours searching for records, he soon began to realize that files were not only missing from the U.S. Lifesaving Service, but also from other federal agencies of the time period.

"I diverted my attention to find out why part of the history of our country was missing," he says. To his amazement, he found out that in 1970, the federal government sold many uncataloged U.S. Treasury Department records from 1795 to 1914.

"I considered it finding the Mother Lode," he said of the records that were sold to a foundation for \$260,000. "It seems strange that they sold these."

But then again, maybe the sale is a reflection of the times. "We are a throwaway society. We don't do a good job of preserving history in this country," Wenberg says.

The small foundation had microfilmed and cataloged the records, but had not had outside requests to review the documents. "I was the first one to ask," Wenberg says. "They let me copy the first book ever printed for the lifesaving service."

The foundation is working with Wenberg and the Chicamacomico Historical Association, but at this time it does not have the staff to handle a large number of research requests.

In the meantime, Wenberg and his team tracked down the surfmen's logs in the Atlanta branch of the National Archives. Those logs should give firsthand descriptions of the lifesaving efforts.

"The logs are now available," Wenberg says. "I am anxious to get somebody down there. It will lead to a lot of things that we are guessing at."

The team also has found records of major universities' libraries. "For the first time in history, we have the availability of knowing every shipwreck — how many lives were lost or saved, how much cargo was lost or saved," he says.

"We can track down the names of the keepers and the superintendents and the types of buildings and architecture. We can track down the various types of boats used," he says.

The research efforts will continue alongside the restoration work on the building. Hurricanes Dennis, Floyd and Irene slowed work last fall, but Wenberg expects to have the exterior renovation completed by this spring. The interior work will take another year.

The Chicamacomico Historical Association also plans to furnish the building — and hopes to utilize plans for the original boat and car.

"My hope is that people can view the building as it was in 1874," Wenberg says. "When people come in, they can look at history."

Yet, once the architectural renovations are complete, there will be tasks ahead for Wenberg.

He dreams of a reunion one day for the families of those who were saved by the Chicamacomico surfmen. ■

TOP:

The interior reveals post and beam detail.

BOTTOM:

Ken Wenberg works on a window opening.



The Sailors' Snug Harbor: Safe Haven for Aging Mariners

By Ann Green

Photos by

Scott D. Taylor

It's happy hour. After entertaining fellow mariners with a round of Irish songs, Ed Kelley, 79, walks down a long hallway decorated with an impressive piece of stained glass hanging from the window.

"This is a ship going into port," says Kelley. "The Latin phrase 'portum petimus fessi' means 'We weary ones seek port.'"

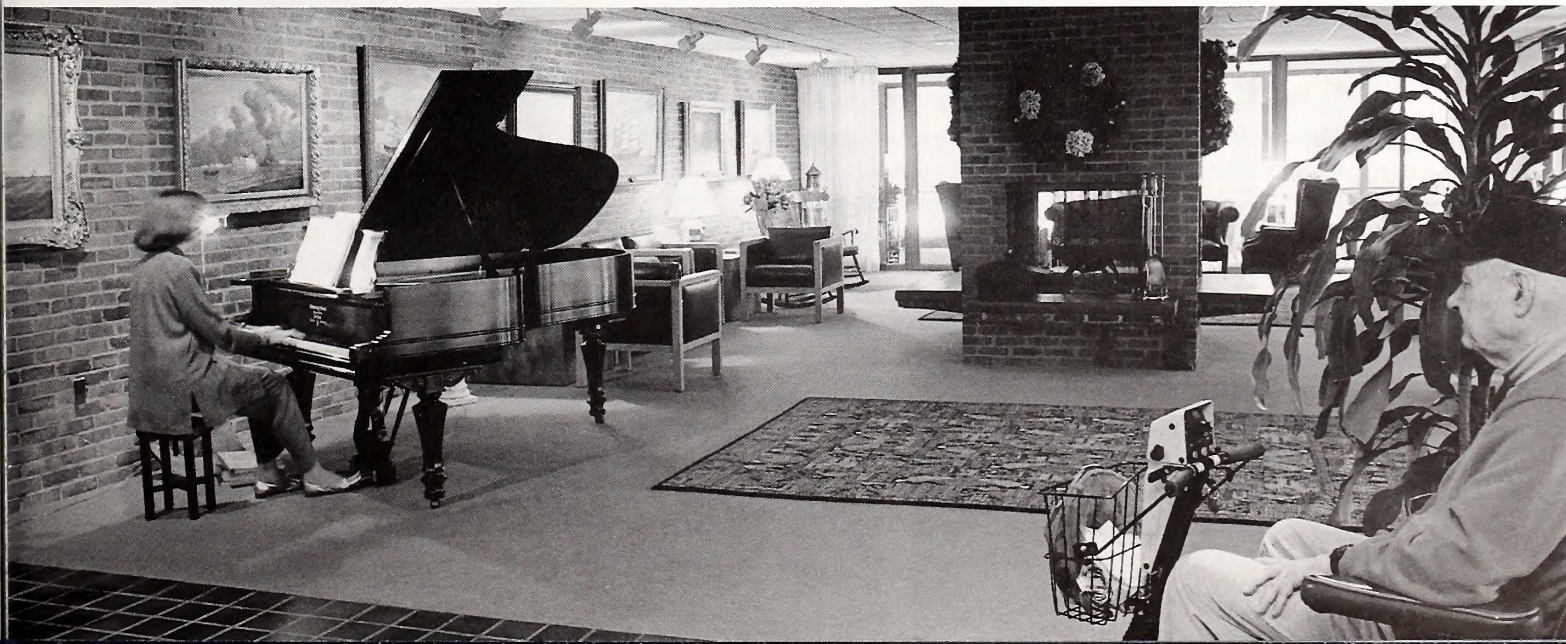
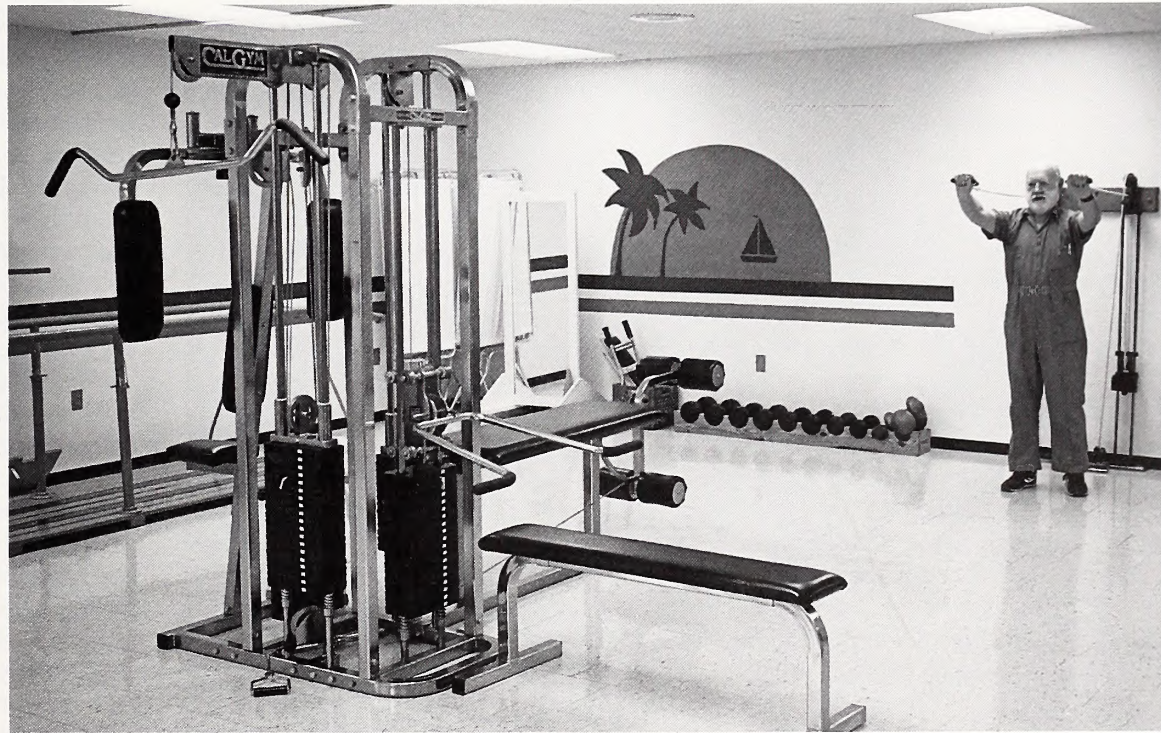
The motto is symbolic of Kelley's life at The Sailors' Snug Harbor. After years of pulling into ports around the world, Kelley has found a safe haven at the retirement community on Nelson's Bay in Sea Level.

"We are a safe harbor for worn out and tired merchant seamen," says Rose Tankard, assistant administrator at Sailors' Snug Harbor. "We take care of them. As far as I know, we are the oldest retirement community in the country."

The facility — which houses men and women who have tallied at least 10 years of deep sea service — was founded in 1801 by Captain Robert Richard Randall, a ship's master and Revolutionary War hero. With guidance from his close associate Alexander Hamilton, he bequeathed his 21-acre estate in Manhattan to a perpetual trust for a home for disabled and retired mariners.



Continued



Sailors' Snug Harbor originally was built on Staten Island's Kill Van Kull in 1833. In 1976, the trustees relocated the facility to a 100,000-square foot complex in Carteret County that houses men — and two women — from ages 60 to 96.

"As the story goes, we wanted to go further south," says Tankard. "We targeted areas from Virginia Beach to Charleston. Then we contacted the Taylor family in Palm Beach," from whom they purchased the property.

Since relocating to North Carolina, the merchant marine home, which has more than 100 employees, has become a vibrant part of the Down East community.

"Sailors' Snug Harbor is the largest employer in Carteret County east of Beaufort," says Don Kirkman, executive director of the Carteret Economic Development Council. "It is a very important part of the Down East economy in Carteret County."

Some of the residents who come from all merchant marine ranks — from seaman to master license (captain) — also participate in community activities.

"We encourage our guys to get involved in the community," says Tankard. "Some of the folks have been active before they come here. Others prefer to be loners."

Each week, Francis "Biff" Bowker spins seafaring tales at the North Carolina Maritime Museum in Beaufort.

One of his favorite stories concerns the four-masted schooner *Helen Barnett Gring*, which crashed into a reef off the Cuban coast.

"It wasn't much fun," says Bowker. "I was at the wheel when it hit a reef. If I had not jumped back, I would have been killed. The wheel spun back."

According to Bowker, the owners may have wrecked the schooner to collect insurance money. He kept a log of the wreck and turned it into the authorities. "However, they didn't do anything at the time."

In his one-room apartment decorated with schooner and steamship pictures, Bowker flips through a photo album,

stopping at an image that will help tell the story of his first sailing adventure. The fading black-and-white photo shows a free-spirited, 16-year-old at the wheel of the *Peaceland* in Nova Scotia.

"It was quite a story," he says. "I had read about a three-masted schooner unloading lumber from Nova Scotia. I went down to the schooner, and the captain told me I could go, but they would not pay me anything."

He says his father was against the voyage, but his mother supported him.

"Mother and Father had a big battle over it," he says. "Mother won. We were gone five weeks. I had to sign off with the British Consul. He asked if I had gotten paid. I hadn't. He gave me 25 cents for the trip. Then I knew I had my fortune made."

Bowker, who captained the Mystic Seaport Museum's schooner yacht *Brilliant* for 22 years, is typical of the mariners at Sailors' Snug Harbor. He worked on several ships, traveled around the world, and has a knack for telling about seafaring adventures.

"A seaman's life attracts a different type of individual," says Pat Ausband, executive director. "They go all over the globe and develop an understanding of economic and cross-cultural issues."

Manteo native Horace Twiford, who joined the Merchant Marine in 1941 before finishing high school, served on freighters and other types of ships all over the world.

He compares living on a ship to being a "goldfish in a bowl."

"You look out," he says. "There is 360 degrees — horizon, sea and sky. You eat, sleep and go to the head. You remember the good times and moments of sheer terror. The rest just becomes one big blank."

"You learn that even the worst voyage will eventually come to an end. Friendships are ephemeral, and death is casual. There is the bond of the sea. That is why coming to Snug Harbor is like going to a ship at anchor awaiting orders."

Like many of the mariners at Snug Harbor, Twiford served in several wars, including World War II.

"I cannot recall anything outstanding about World War II except a sympathy for the Germans in submarines after the middle of 1943. We had made the Atlantic more or less an American lake by that time, and they did not have a chance."

When Twiford retired as a navigator, he moved to Stumpy Point and fished and harvested oysters for a living. He also became involved in conservation issues related to fisheries.

Now he spends most of his time talking to fellow mariners and logging on to a Web TV in his one-room apartment that overlooks a grassy area.

"I traveled all my life," he says. "Right now, I have no desire to go anywhere, even to Morehead City."

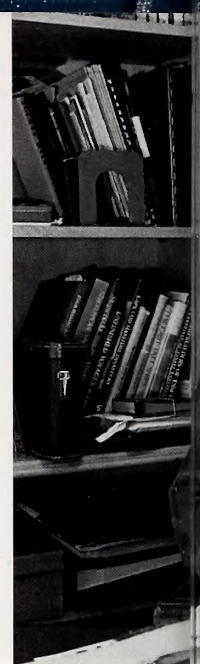
To make Twiford and other seamen feel at home, Sailors' Snug Harbor is decorated with shipping artifacts in the public areas.

In the hallway, a wooden ship's wheel reminds one of a sailor steering a ship through rough water. Dozens of oil paintings depict a bygone era when three- and four-masted schooners carried cargo along waterways. An old ship's bell once called the crew to man their posts. A telescope calls to mind a sailor peering at stars on a clear night. Colorful flags symbolize a time when American shipping companies flourished.

The library also is decorated wall to wall with shipping artifacts — from wooden models of ships to a large map of the Outer Banks. In the game room, a macrame shaped like anchors and ship paintings adorn the walls.

"Some of the model ships were built by residents years ago," Ausband says of the models. "Most of the art and artifacts were donated."

Surrounded by pine trees and cool ocean breezes, Sailors' Snug Harbor provides a continuum level of care for





aging seafarers — from independent living to intermediate and skilled nursing.

"We provide all the necessary amenities to retired seamen so they can enjoy their retirement years," says Ausband. "Our method is to try to spoil them. The building is secure and luxurious. The meals — while not on par with the Waldorf Astoria Hotel in New York City — are a step above many retirement communities. We also have a top-rated medical facility."

The facility can provide extra amenities for the aging mariners because of the generous trust fund set up by Randall.

"Our residents pay based on a percentage of their incomes," he says. "The merchant seamen's payments are only 20 percent of the operating budget. The rest comes from the trust fund."

The mariners' days are filled with activities — from working out in a first-class gym to woodworking and gardening.

In a woodworking shop, Walter Mrozinski is building a dollhouse that he is giving to Snug Harbor employees. He also does pencil drawings and exercises in the gym.

"I love it here," says Mrozinski, who was born in Poland in 1916 and worked on steamships. "All the sailors remind me of a big ship. I worked as a chief steward (managing food services) on several ships during World War II."

Other seamen are involved in special projects as varied as their experiences. Homer Wright has



Top left, resident Biff Bowker; top right, piano player Dee Bryson; bottom, resident Horace Twiford.

compiled a book of poems about the sea.

"I wrote them in longhand," he says. "I was on about 80 ships."

At meals, during happy hour when wine and beer is served and on other social occasions, the mariners gather and tell stories. At times, the rugged looking men become quite boisterous.

"I have lived here for five years," says Kelley. "It is beautiful and fun. At times, I get in trouble."

Because many residents don't have families to visit, the employees spend

extra time chatting with them and creating a "family atmosphere."

"We have a lot of neat characters here," says Tankard. "The guys have done so much. They have been around the world. They are special."

Because of the modernization of the shipping industry, fewer people are becoming merchant marines.

"It is a declining industry," says Tankard. "The population at Sailors' Snug Harbor is shrinking but that was predicted." ■

Coyote Influx Threatens Red Wolf Survival

By Renée Wolcott Shannon

Coyotes. In popular consciousness, they slink through sagebrush and sand under a desert sky, frighten ranchers' cattle and howl at the Arizona moon. In truth, coyotes are just as likely to prowl under a North Carolina sky — and biologists with the federal red wolf re-establishment program are the ones who are howling.

Though red wolves and coyotes are different species, they are both canids, and all canids — wolves, foxes, dogs — can interbreed. In eastern North Carolina, where the endangered red wolves have established a tenuous wild population, the coyotes' inroads could spell disaster. If coyotes and red wolves continue to mix, the red wolves could disappear once again, replaced by hybrids or coyote-wolf "mutts."

This is not a new problem. In fact, interbreeding helped bring the red wolf to the brink of extinction in the first place. Until early this century, *Canis rufus* was common throughout the southeast. As the decades progressed, hunting, trapping and clearing land for agriculture forced dwindling red wolf populations into ever smaller areas.

By the 1960s, red wolves fought for survival on pockets of land in Texas and Louisiana, interbreeding with coyotes as their numbers rapidly declined. Alarmed officials from the U.S. Fish and Wildlife

Service began trapping the wolves in the 1970s, afraid the species would vanish. Out of hundreds of animals, they found only 14 pure red wolves. These became the captive breeding stock for an experimental wolf re-establishment program.

In 1987, the federal program released its first red wolves into Alligator River National Wildlife Refuge, a gift of almost 120,000 acres from the Nature Conservancy. Considered extinct in the wild, the zoo-bred wolves struggled to adapt to their new environment of woods, fields and swamp.

Over the next five years, the Fish and Wildlife Service released an additional 40 wolves onto the refuge. While some succumbed to vehicle accidents, deep water or illness, the Alligator River site lacked one important threat: coyotes.

"One of the many reasons Alligator River was chosen in the first place was because it was coyote free," says Scott McLellan, biological technician with the red wolf program.

For several years, the red wolves flourished, relatively safe from other canids that could introduce new genes to the pool. "We've had a lot of biological successes," says Jennifer Gilbreath, outreach coordinator and biologist with the red wolf program. After a few initial setbacks, the population began to grow on

its own, producing new generations of wild-born wolves.

"They've been reproducing for 12 years now," McLellan says. "They reproduce fine." Today, more than 80 red wolves reside on one million acres in northeastern North Carolina, from the Pocosin Lakes and Alligator River refuges to Lake Mattamuskeet and surrounding private lands.

In the entire nation, there are about 170 in captivity and around 10 on islands, Gilbreath says — a strong comeback from 14 individuals only two decades ago. Yet as red wolves have rebounded in North Carolina, coyotes have moved into the area, once again threatening the species' genetic purity. "Some people have illegally brought coyotes into these areas," McLellan says. Others have simply migrated from western counties, where they have been common for years.

Coyotes are survivors, McLellan says. In the past century, they have spread through the country's 48 contiguous states, including North Carolina. "They're a very adaptable species. They can live in the desert, the mountains, the forest, the swamp. I guess you could say they're

C o n t i n u e d

Red wolf releases began in 1987.

Barron Crawford/USFWS

NATURALIST'S
NOTEBOOK

NATURALIST'S NOTEBOOK

smarter than wolves. ... People have been trying to exterminate the coyote for 150 years, unsuccessfully, but look how relatively easily the red wolf was brought to the point of extinction."

Fish and Wildlife Service biologists are now taking up the age-old battle against the coyote, but it's difficult to wage war against a creature so close to the red wolf in appearance. Though coyotes are smaller, about half the size of red wolves, they have similar markings. "If I were to see one over 150 yards away, I'd only be able to say, 'That's a small canid,'" McLellan says.

Up close, the two species do have recognizable differences. "A coyote generally has a smaller, narrower face, smaller ears and a smaller muzzle," McLellan says. "Also, their feet are much smaller than a wolf's." Yet if the program placed a bounty on coyotes, concerned citizens would likely kill as many red wolves as their canid cousins.

For now, the Fish and Wildlife Service staff settle for trapping all the red wolves, coyotes and hybrids that they can, outfitting them with radio collars to track their movements. "We don't know to what extent they are interbreeding," McLellan says. "Right now we're sterilizing non-wolves, putting collars on them and releasing them to their home ranges. ... They serve as space holders until we can replace them with red wolves."

Overall, the red wolf program has been a success, despite the threat of hybridization, McLellan and Gilbreath say. The wolves have reproduced well in the wild, and scientists and wildlife managers have gleaned vast amounts of information about what red wolves need



Coyotes are about half the size of red wolves.

George Harrison/USFWS

to survive. Many partners have joined the Fish and Wildlife Service in supporting the project, including the NC State College of Veterinary Medicine, the N.C. Zoological Park, the N.C. Department of Transportation, the N.C. Wildlife Resources Commission and Duke University. The University of Idaho and Trent University in Canada assist the program with genetic research.

"There has always been tremendous public interest in the program," Gilbreath says. Last year, the Fish and Wildlife Service made her the program's first outreach coordinator, in charge of working with the media and keeping the project's Web site up-to-date.

The red wolves have drawn mixed reaction from the surrounding communities. But some who were at first skeptical

have softened their stance. Initially, "the main issue was the safety of families, pets and livestock," McLellan says. But the red wolves proved to be notoriously shy and retiring. "You rarely see them, unless you're out there at night."

In fact, the desire to make contact with the wolves is much stronger than any lingering fear. "We've been doing howlings for 12 years, and they've always been popular," McLellan says.

"As many as 300 people have come to one."

At the howlings, staff members make a short presentation on the wolves' history and biology and provide information on the re-establishment project. Then staff members lead the rapt audience through the woods until they are near some of the captive wolves — individuals "who didn't do so well in the wild," McLellan says. When the guests howl into the darkness, the wolves always howl back.

"It's great to see the reactions of people," McLellan says. "They get so excited ... their mouths are gaping open, their jaws are on the ground. They always stay still for a few minutes, just listening."

As for McLellan himself, the eerie, spine-tingling music of the wolves still amazes him every time. Like so many others in North Carolina, he hopes it will never be silenced. ■

For more information about the red wolf re-establishment program, or to get a schedule of upcoming wolf howlings, contact the Alligator River Wildlife Refuge at 252/473-1131. On the Web, check www.outer-banks.com/alligator-river/redwolf.html, www.fws.gov/r4all/redwolf.html and www.nczooredwolf.org/.



JoAnne Powell shows a shell to a group on a field trip to Rachel Carson Reserve.

JoAnne Powell:

Extraordinary Educator

By Ann Green

As JoAnne Powell guides a group through a salt marsh on Rachel Carson Reserve on Taylor's Creek, she realizes she is missing an important piece of equipment.

"This is one of the few times that I have forgotten my binoculars on a field trip," says Powell, education curator at the North Carolina Maritime Museum in Beaufort. "I am out of my element. I love to watch birds."

Even without her binoculars, Powell spots a sanderling running up and down the beach and a willet feeding on a mud flat.

"We know it is a willet because of the white stripes on the wings," she says. "Without the stripes, it looks like many other shore birds."

Powell's enthusiasm for birds has become legendary around Carteret County. She initiated the first birdwatching program at the Maritime Museum and has taken

numerous birding trips to South America.

"JoAnne is an excellent birder and a great educator," says North Carolina Sea Grant marine education specialist Lundie Spence. "She can wind a story between a bird, the island's history and its people. She gives a full story."

Because of her interest in birds and boundless energy, Powell has been compared to a hummingbird.

Continued

"Hummingbirds flit from flower to flower," says Jeannie Kraus, natural science curator at the Maritime Museum. "JoAnne flits from project to project."

While leading a group of adults through a marsh, mud flats and watering area for feral horses, Powell walks fast and weaves in some interesting tidbits about the fiddler crab's mating cycle.

"When a male crab mates with a female, he seals the female off in a chamber," she says. "When the female goes into seclusion, the males protect her from being killed or eaten by other critters."

For more than 23 years, Powell has been conducting field trips to Rachel Carson, a complex of marshes, tidal flats and dredge spoil islands between the mouths of the Newport and North rivers. She initiated the museum's first trip to the state and federal reserve across from Beaufort.

"It is a neat place to go because it shows different aspects of a barrier island," she says. "You can teach about the dunes as well as the mud flats."

Powell was one of the first environmental educators in Carteret County doing field trips, according to Kraus. "Now, there are so many organizations that organize field trips."

Powell says that field trips give adults an opportunity to learn about the state's coastal system and appreciate it more.

"Unless someone leads them, adults usually can't figure out how the ecosystems work," says Powell. "So many coastal regulations are based on protecting the environment. If someone has an understanding of the environment, he can better understand regulations or make sound decisions that affect our future."

Besides field trips, Powell has initiated numerous museum programs for adults and school children — from ancient coastal environments to coastal birds.

"JoAnne is an outstanding educator with more than 20 years of hands-on experience with public programs relating to the natural history of our coast," says George Shannon, the Maritime Museum director.

"Through her efforts, the museum has been able to offer the public more than 300 public programs a year."

One of the most popular — a strange seafood program — evolved into the Strange Seafood Exhibition, which was held for more than 20 years until it was discontinued recently. Powell began the workshop in 1977 with colleague Judie Spitsbergen.

"I had been to Europe and knew they ate seafood that was not in the restaurants here," she says. "So we made up recipes for sea urchin, shad roe — a traditional North Carolina dish — and other types of strange seafood. We had over 100 people show up for the first exhibition. After that, we did it free for a number of years." When the festival expanded to over a thousand participants and 150 volunteers, they added a fee.

Although Powell grew up playing on California beaches, she didn't develop a real interest in the marine environment until attending the University of California at Davis.

"When I took biology, I knew that was what I was going to do."

After majoring in biology, Powell landed a job sampling water for Orange County, Calif.

Shortly after that, she was recruited by the New Hanover County School System to teach oceanography in the high school and marine science in a 4-H summer program.

During that first summer, Powell learned about the natural history of the state's coast. She fell in love with the diverse plants and marine life on North Carolina's beaches and never left.

In 1975, she began working part-time at the Maritime Museum.

"I started doing field trips, and it mushroomed," she says. "We made a lot of headway when the new museum was built in 1985."

In 1990, Powell was promoted to director of the museum's education branch. Her responsibilities include supervising educational programs and special exhibits.

She also coordinates the annual

Summer Science School for children in grades 1 through 10. The program, which changes annually, offers educational opportunities that children can't get in a classroom.

Last summer, youngsters took overnight trips to Cape Lookout and studied barrier islands, sea turtles and other wildlife. In other courses, the students got to kayak, surf and learn about coastal navigating and model boat making.

"We feel it is extremely important for children to learn about their environment while getting their feet wet and hands muddy and having a hands-on experience," she says.

Powell's museum office reflects her diversity as a marine educator and international traveler. The walls are decorated with a variety of artwork — from a fish batik to a boat print.

A cabinet top is packed with artifacts donated to the museum, including a canoe paddle and seed necklace from the Amazon. She also displays wooden birds from her birding trips to the Amazon and Trinidad, known for its vibrant birds.

"I have gotten to head trips to many countries," she says. "In Trinidad, the guide took us to birding hot spots. I saw hundreds of birds that I had never seen before."

Powell also shows off a champion loon caller plaque given to her at the Waterfowl Festival on Harkers' Island. Several years ago, she learned to sing like a loon — a large migratory waterfowl found on Core Sound.

"I was a world-class loon caller," she says. "It been so long since I won that I can't call like a loon very well anymore."

As an avid birder, Powell says that she would like to take groups on more international birding expeditions, including Trinidad, Tobago, Australia, New Zealand and the Pantanal — Brazil's great savannah.

"It is wonderful to get the opportunity to organize these trips for people who really appreciate and enjoy learning about the natural wonders and unique cultures of the world," she says. ■

Waves, Wind and Water:

Read Up a Storm!

By Renée Wolcott Shannon

Winter days are such cozy, comfortable times, at least indoors. The leaves have fallen and a chill is settling in, but inside are warm rooms and firelight, and the companionship of friends and family. It's easy to forget how cold and perilous this time of year can be, especially along the Outer Banks with a bitter nor'easter howling.

This year, add some zip to your winter routine with these pulse-racing reads. I've

selected books that celebrate nature's wild side, bringing unseasonable thrills and watery adventure right into your living room. In these pages, you'll witness North Carolina lifers' heroic feats of strength and acts of bravery, feel the brute force and screaming winds of an Alaskan williwaw, and paddle raging African rivers with fearless whitewater rafters — all from the comfort of your favorite easy chair.

So treat yourself to something special this winter season: a book that brings the outdoors in.

The Lost River: A Memoir of Life, Death, and Transformation on Wild Water by Richard Bangs. 1999. Sierra Club Books. Random House, Inc., 201 E. 50th St., New York, NY 10022. 266 pages. Hardcover, \$25. ISBN 1-57805-026-X.

Armchair adventurers and real-life thrill seekers will appreciate Bangs' improbable autobiography. With enviable determination, bald-faced lies and depthless bravado, Bangs transforms himself from an average Maryland boy to accomplished river guide, tackling the fiercest rivers on the planet. *The Lost River*

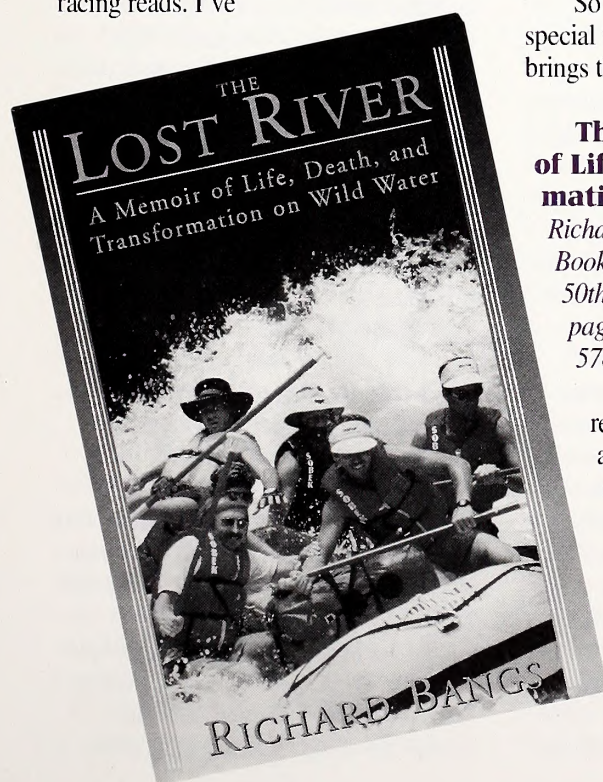
focuses on his obsession with the virgin waters of five tumultuous Ethiopian rivers: the Awash, Omo, Baro, Blue Nile and Tekeze.

The narrative spans the years between 1967 and 1996, following Bangs as he progresses from weekend paddling on the Potomac to rafting the Colorado to plunging down the world's wildest rivers. He is a man transfixed by "the knowledge that the cosmos could be reduced to a cool, wrapping white wave, to the pull of an oar or the twist of a tiller, to the crest of a wave" — by the majesty and power of fast-moving water.

That wild power, of course, can result in tragedy as well as transcendence. In Ethiopia, Bangs loses two men in fierce rapids, one of them a close friend. *The Lost River* thus becomes much more than an adventure story; it is also a tale of one man's struggle with loss and remorse, and of his final reconciliation with the beautiful, perilous sport that he loves.

As you read, you'll share Bangs' remarkable encounters, both in Africa and closer to home. His dramatic style, which ranges from lavishly embellished to downright bombastic, makes his expeditions as frothy on paper as they were in reality. A fairly indicative sentence: "He (a water buffalo) glow-

Continued



BOOK MARKET

ered with almost tangible menace, pawed the ground, and snorted short Hemingway sentences, resonant with ill will."

Bangs battles charging crocodiles and hippos; flees an angry wildebeest, the Ethiopian revolution and tribesmen seeking testicular trophies; wanders the Ethiopian wilderness, lost and with shin splints; and explores the cliff-side dwelling of an invisible African hermit. He also climbs glorious waterfalls that send tendrils winding down rocky riverside gorges, explores the ancient history revealed in the layered stones of river beds and rediscovers his passion for wild water on one of North Carolina's own rivers, the Chattooga.

The Chattooga is not Bangs' only North Carolina tie, either. Buried in the middle of the book is a reference to Ann Pierce, a young woman who met Bangs in Addis Ababa in 1973 and rafted halfway down the Omo with him, paying for her trip with fresh food for the journey. Pierce is now on the North Carolina Sea Grant staff, braving the calmer waters around our Manteo office.

If you're hankering for exotic locales, vicarious thrills and an unusual telling of the old story of self-discovery, don't let Bangs' excess of adjectives scare you. This is a book that brings you to the heart of unspoiled African wilderness. The author's sometimes overwrought prose cannot obscure the mysterious beauty of riverside landscapes, or the joy of conquering a roiling white river.

Hatteras Light by Philip Gerard. 1986. John F. Blair, Publisher, 1406 Plaza Dr., Winston-Salem, NC 27103. 232 pages. Paperback, \$12.95. ISBN 0-89587-166-1.

This novel whisks readers back to 1918, to the tail-end of World War I, when Germany is sure to fall but U-boats still threaten North Carolina's shores. Gerard, who makes his home in

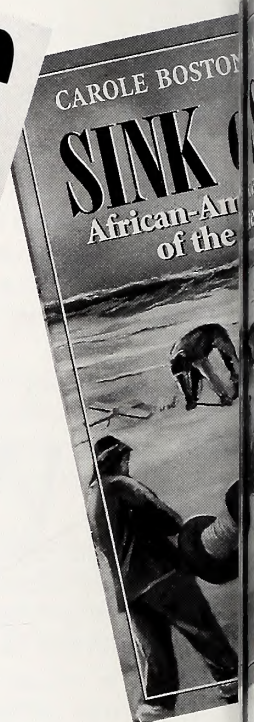
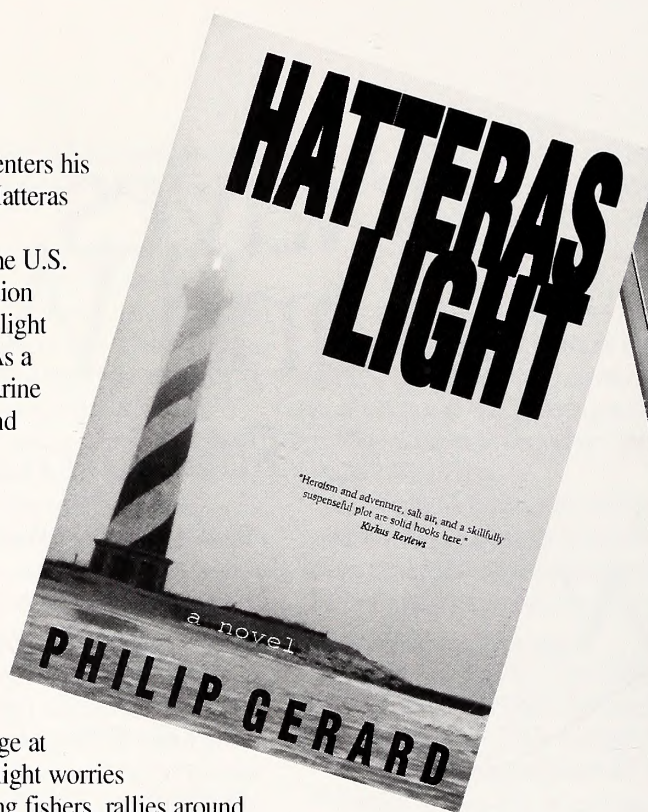
Wilmington, centers his action on the Hatteras lighthouse.

In 1918, the U.S. Lifesaving Station adjacent to the light is still active. As a German submarine prowls Diamond Shoals, the lifesavers are kept busy saving men from ships sunk by the U-boat's torpedoes or deck guns. The village at the foot of the light worries about its missing fishers, rallies around its heroes and scoffs at the Navy's ill-informed attempts to destroy the submarine. At last, the villagers must turn to their native knowledge and resourcefulness to protect their loved ones and fragile homes.

Gerard tells his story well, with a talent for capturing the romantic entanglements and emotional undercurrents that bind and divide families and small-town residents. His narrative follows multiple story lines, skipping from character to character to offer a well-rounded portrait of an Outer Banks community struggling to stick together in crisis.

You'll grow to love Gerard's motley crew of believable characters. Dorothy Dant is a young woman from a family plagued by tragedy, desperate for a new life far from the lonely shores of North Carolina. The Royal brothers, lifesavers all, are a trio of quiet, well-intentioned men who brawl more because they are alike than because of their differences. Patch Patchett is especially endearing, the village ne'er-do-well who becomes an unlikely hero.

Max Wien, surgeon's assistant on

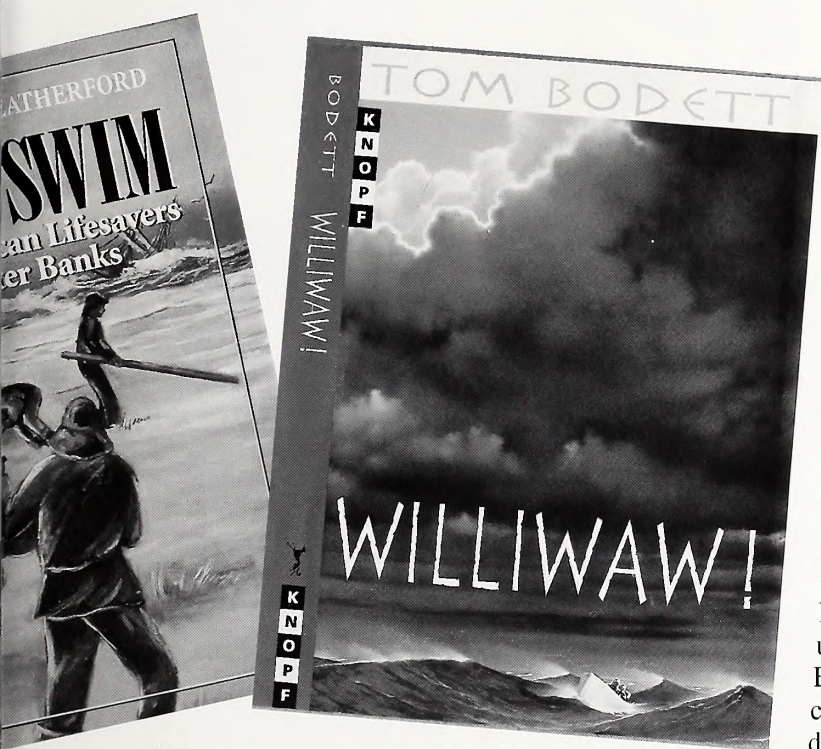


the U-boat, is also poignantly drawn: a man far from home, without much hope of surviving, who constantly questions the orders he must obey. In his humility, he serves as a perfect foil for the other outsider in the novel: Tim Halstead, an arrogant, foolhardy Navy lieutenant who wrecks his only chance at greatness.

The novel's end is satisfyingly realistic. Though the village is safe once more, Gerard leaves enough loose ends to keep readers guessing, wondering, following the characters in imagination long after the book is closed.

Sink or Swim: African-American Lifesavers of the Outer Banks by Carole Boston Weatherford. 1999. Coastal Carolina Press, University Place Office Park, 4709 College Acres Dr., Suite 1, Wilmington, NC 28403. 80 pages. Hardcover, \$15.95. ISBN 1-928556-01-9.

In her latest book for young people, published by the new Coastal Carolina Press, this High Point author brings readers the sometimes shocking, ulti-



mately uplifting true story of African-American lifesavers in North Carolina. Though black lifesavers served at stations up and down the Outer Banks, the history of the only all-black lifesaving station, Pea Island, was forgotten for a full century. Weatherford restores the Pea Island station and its heroic staff to their rightful place in our state's history.

I fell in love with Weatherford's clear, poetic prose. She breathes life into an extraordinary man: Richard Etheridge, a slave who learned to read and write, joined the Union Army upon liberation, and ultimately became the keeper of the Pea Island station, all against outstanding odds.

"The ocean did not only claim lives — it also bred heroes," Weatherford writes. Etheridge, who survived terrible conditions and institutionalized racism, saved many shipwreck victims off the shores of Pea Island. He and his crew even swam to one wreck in the middle of a hurricane, rescuing everyone on board.

The book not only tells the story of a valiant man and his crew, it also brings

apparatus cart, breeches buoy and life car, and their work was strenuous and difficult as well as dangerous.

Children and adult readers alike will be amazed at the accomplishments of the Pea Island lifesavers, and at the indignity they suffered at the hands of a racist society. "In the sixty-nine years that Pea Island Station operated," Weatherford writes, "its crews received more inspection commendations and saved more lives — over 600 — than any other station in the Lifesaving Service." Yet Richard Etheridge and his crew were forgotten until 1988.

In 1995, after a letter-writing campaign and lots of hard work, the Pea Island crew finally received its due. The commandant of the U.S. Coast Guard awarded Etheridge and his crew the Gold Lifesaving Medal for extreme heroism in front of an audience of their descendents and former Pea Island lifesavers.

This is a clear-eyed, thought-provoking book that celebrates real North Carolina heroes — something to read and to treasure.

home the tough realities of lifesaving. With help from historical line drawings and photographs, Weatherford illustrates the lifesaving gear and rescue methods of the time. Lifesavers under Etheridge's command drilled endlessly with the beach

Williwaw! by Tom Bodett. 1999. Alfred A. Knopf, Inc. Random House Children's Books, 201 E. 50th St., New York, NY 10022. 192 pages. Hardcover, \$16. ISBN 0-679-89030-0.

You may know Bodett for his Motel 6 commercials or his stint on National Public Radio, but this book proves that he is also an accomplished writer. I waded into *Williwaw!* with trepidation, unsure what to expect, and emerged transformed. You and your kids will be riveted.

Bodett sketches his young characters, September and Ivan Crane, and the Alaskan wilderness with fondness and great dexterity. September and Ivan have the usual sibling squabbles — he's a video-game addict, she's a bookworm and nature lover — but their relationship has an added dimension: their father, a commercial fisher, leaves them home alone for weeks at a time after their mother dies in a fierce Alaskan windstorm called a williwaw. And home is in a remote cove, an hour by boat from the nearest town.

That is not to say that their father is neglectful — in fact, he's saving up for a larger boat so they can stay together during future fishing seasons. He keeps in touch by radio and has the mail carrier stop in to check on them, and he lays down some strict rules for them to follow. But when September and Ivan break the rules, they are forced to rely on their own hard work and ingenuity — and to face the consequences of their actions.

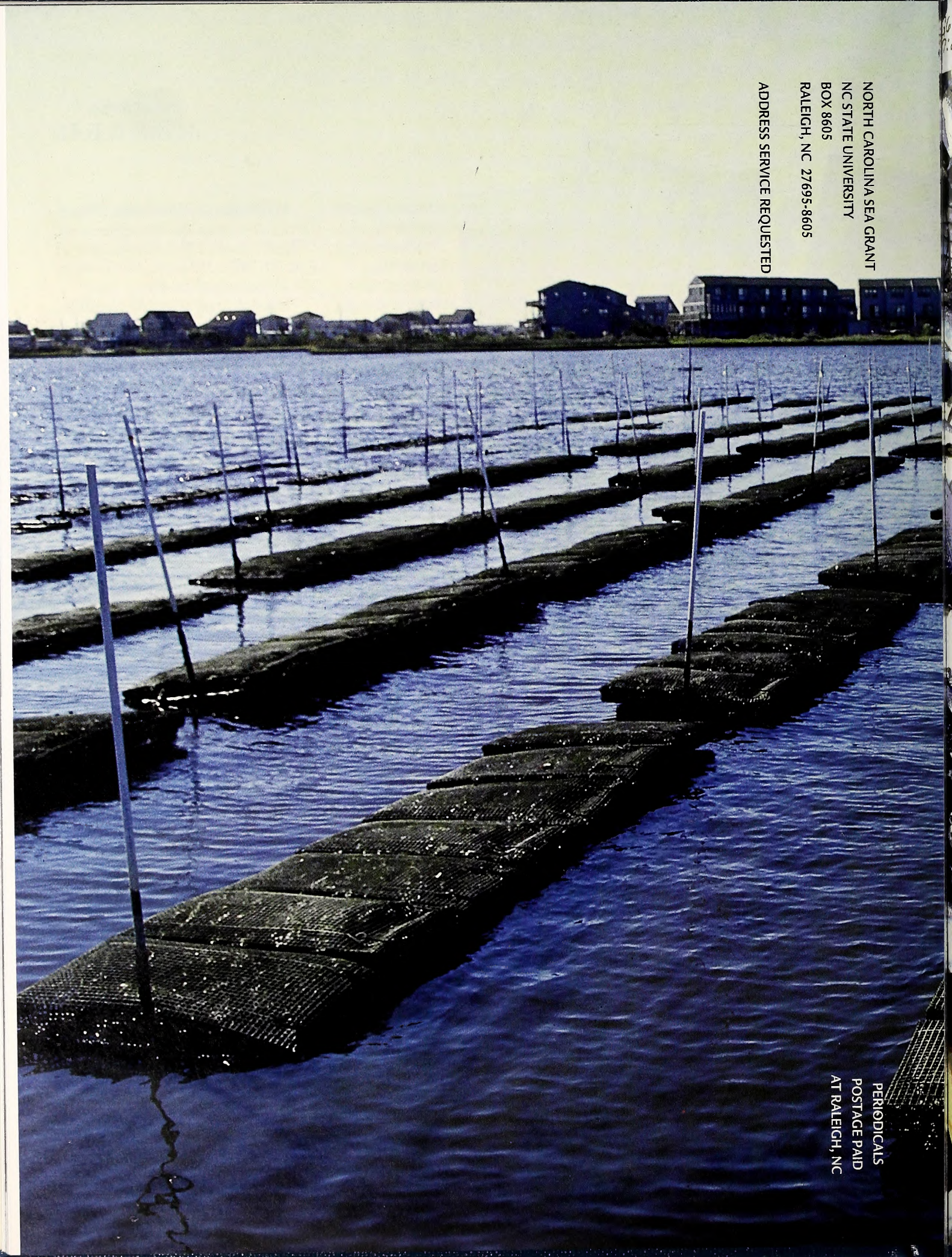
With good humor, high adventure and a flair for detail, Bodett uses *Williwaw!* to explore the importance of truthfulness and responsibility, while also applauding the resourcefulness of his youthful characters. Young readers will identify with the fears and desires of the novel's heroes, and the book's emphasis on trustworthiness is always engaging, never preachy.

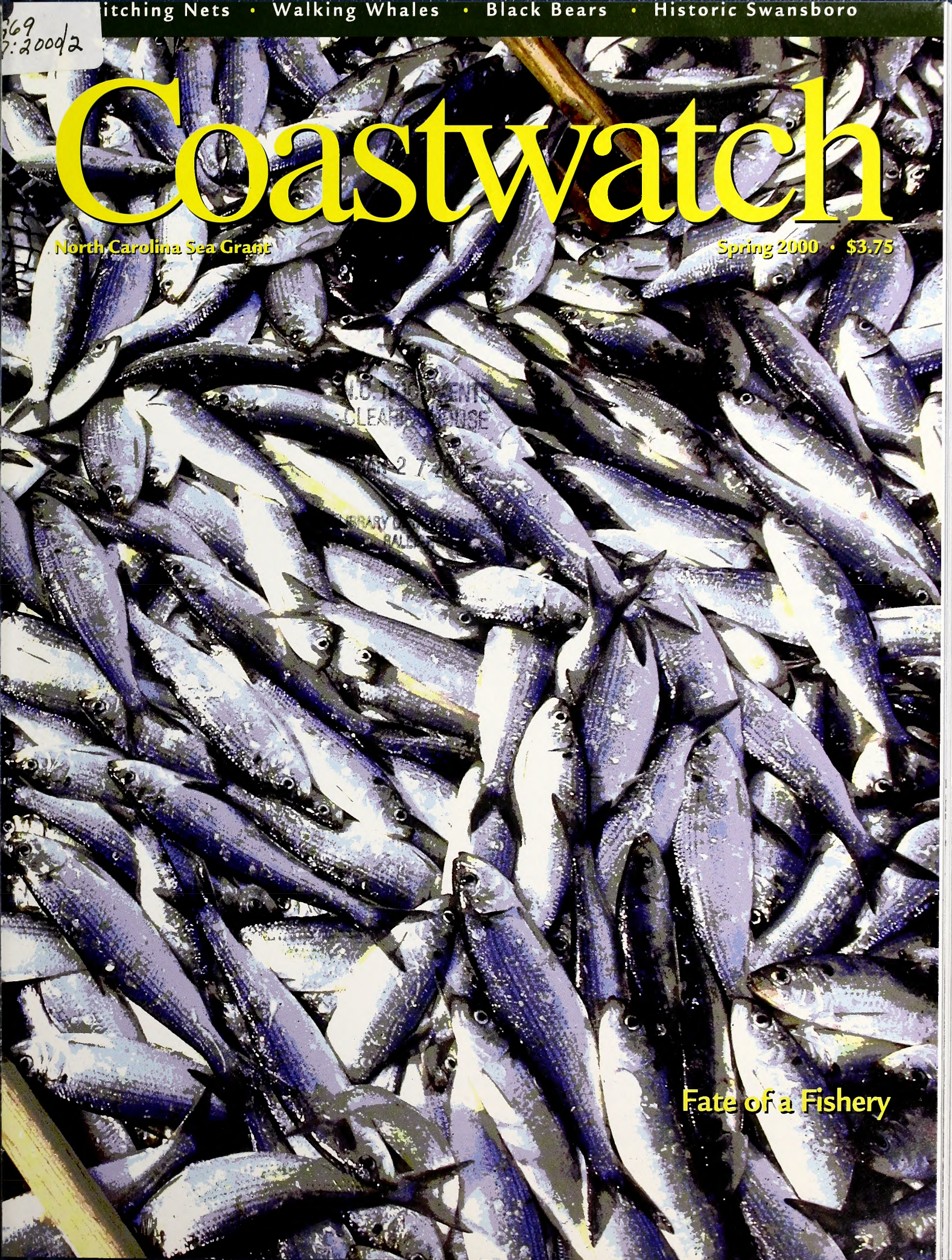
Williwaw! makes a perfect, suspenseful fireside read for the entire family. Give it to someone you love, or just indulge yourself. ■

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Fate of a Fishery

A Lion or a Lamb?

Maybe Spring 2000 will skip the lion bit and just come on in like a lamb.

Such is the plea from many North Carolinians who in recent months have seen weather records shattered, from massive flooding that followed Hurricane Floyd to two feet of snow in January.

And while we all know that April showers bring May flowers, many Tar Heels will be checking both the *Old Farmer's Almanac* and the latest online forecasts.

North Carolina Sea Grant researchers will continue to monitor rivers, estuaries, sounds and coastal ocean waters for environmental effects from Floyd's floods, not to mention the effects of the melted snow and melting agents, as well as other winter storms.

Initially, Floyd's freshwater plume lowered salinity levels. Pockets of low oxygen levels resulted in stressed fish and shellfish, but no major fish kills. In October, coastal residents braced themselves for Hurricane Irene, but that storm actually helped areas such as Pamlico Sound, where winds stirred the soupy waters, renewing some mixing of salt and oxygen.

Before the January snow hit much of the state, Pamlico Sound still was showing areas of salinity half the normal rate. "There is a lot of fresh water that needs to exit the system or evaporate," says Hans Paerl of the University of North Carolina Institute of Marine Sciences. In the Pamlico, that exit normally takes almost a year.

In six weeks following Floyd, the sound received as much nitrogen and other nutrients as it normally receives in six months, Paerl says. More nutrients could result in a higher productivity rate for algae. "It depends on the weather. If it is calm, stagnant and sunny, we may see some blooms that could reduce oxygen levels," Paerl says.

Mike Mallin of the University of North Carolina at Wilmington is watching for heavy rains in swine-producing areas. If Floyd's floodwaters carried animal waste into the flood plain, those deposits could be washed back into the Cape Fear system with winter and spring rains. "It may come back to haunt us," says Mallin, who heads the Lower Cape Fear River Program.

So far, the Cape Fear system, which moves water to the coastal ocean much more quickly than the Neuse/Pamlico estuary, has had nutrient levels within average ranges. "The residence time in this



estuary is days. Water that runs out of the Cape Fear gets out fast," says UNC-W scientist Larry Cahoon, leader of a team studying the coastal ocean off the Cape Fear.

The Cape Fear system received a large volume of nutrients in the flood runoff, but the load was diluted by the 19 inches of rain. "We dodged a cannonball," says Cahoon, who will continue sampling this spring. "This area had an immediate impact with the flooding, but limited effects on water quality."

Sea Grant scientists will present post-Floyd studies at the Water Resources Research Institute Conference March 30.

North Carolina Sea Grant researchers have a new leader. Steve Rebach joined us in January as associate director for research. His years at the University of Maryland Eastern Shore included a variety of research projects involving blue crabs, a major fishery in both Maryland and North Carolina.

Just as the Sea Grant staff and friends were welcoming Steve Rebach, we found ourselves planning a farewell for Steve Olson, associate director for outreach, who is now leading governmental relations for the American Zoo and Aquarium Association.

Officially, one of Steve Olson's jobs was to give our communication and extension efforts a more unified "outreach" approach. But in January 1999, his leadership abilities took on new light as we coped with the plane crash that critically injured our director, Ron Hodson. Steve's compassion was clear as the staff shared in the grief of the loss of Ron's wife, Ruthie.

As Ron gained strength and was able to work from home, Steve would visit most days. They would review work details, discuss Ron's therapy progress, or maybe just discuss ways to roast duck.

In November, we were elated when Ron returned to the office on a daily basis. We had stayed afloat during rough seas. And with the arrival of Steve Rebach, we would be at full staff for the first time in several years.

But there is one thing that working with coastal and marine issues teaches you: The most constant factor is change. So, we offer our best to both Steves. And we look forward to a gentle spring.

Katie Mosher, Managing Editor

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Coastwatch

Features

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The Fate of a Fishery

Shad and River Herring at the Turn of the 21st Century

The arrival of spring includes not only daffodils and dogwoods but also the annual herring and shad runs on coastal rivers. Generations of North Carolinians feasted on the bounty of these fisheries, but in recent decades the catches have dwindled. Renée Wolcott Shannon takes a look at prospects for the new century. 6

A Stitch in Time

Netmaking is Becoming a Lost Art

Only a few netmakers practice their time-honored profession in coastal North Carolina. Ann Green visits with several generations of netmakers to learn the history of the art and to assess the current demand for nets. 14

Take a Walk on the Wild Side

Step back in time to the dawn of life. The saga of eons and epochs along the North Carolina coast are told in the treasure trove of fossils at the new North Carolina Museum of Natural Sciences. Pam Smith takes you on a fantastic journey that includes a marine evolutionary triumph: the whale. 20

Naturalist's Notebook

Black Bears, Shy Giants of the Pocosin

Once considered a species of "special concern," because of its dwindling numbers, the black bear has made a comeback. Sightings of this massive mammal are becoming more frequent in coastal wilderness areas. Cynthia Henderson Vega shares insight on this resident of the pocosin forests. 26

People & Places

Swansboro, Quaint Village is Former Port

In the rush to reach oceanfront rentals on Bogue Banks, many tourists miss out on a chance to see restoration efforts in historic Swansboro. Ann Green takes you on a walking tour of this picturesque village in Onslow County. 28

Coastwatch

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The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 12-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

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Front cover photo of herring catch and table of contents photo of Renée Wolcott Shannon's first fish by Scott D. Taylor.

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COASTAL TIDINGS

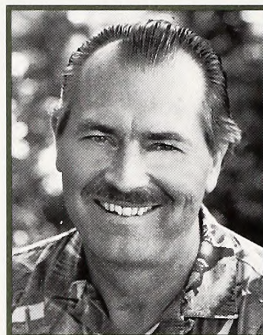
Hodson Receives Aquaculture Honor

North Carolina Sea Grant Director Ronald Hodson has been given a Friend of Aquaculture award from the North Carolina Aquaculture Association.

The award, which recognizes Hodson's contribution to the development of the hybrid striped bass industry, was presented at the annual North Carolina Aquaculture Development Conference held recently in New Bern.

Hodson is recognized nationally and internationally for his aquaculture work. His research and extension efforts took hybrid striped bass farming from demonstration projects to an industry that generates millions each year.

"If it hadn't been for his persistence and dogged determination, we would not



have this industry," says Tom Ellis, who heads the aquaculture division of the North Carolina Department of Agriculture and Consumer Services. "He can put forth the science in a manner that people can use it."

Hodson joined North Carolina Sea Grant in 1981 as associate director for

research. He was appointed director in 1998 after serving 18 months as interim director.

In addition to extensive research, Hodson has written a manual, *Farming a New Fish: Hybrid Striped Bass*, which describes how to get started in fish farming. For information on the manual and other aquaculture topics, contact North Carolina Sea Grant at 919/515-2454, or check the Web at www.ncsu.edu/seagrant. — K.M.

Sea Grant Heads Dockside

The North Carolina Sea Grant Wilmington office has sailed into a new port at the Center for Marine Science at the University of North Carolina at Wilmington.

The new building houses research labs and offices for UNC-W scientists. Nestled behind Masonboro Island, the facility includes a dock and water access.

The new mailing address is North Carolina Sea Grant, 5001 Masonboro Loop Road, Wilmington, NC 28409

Sea Grant staff will have direct phone lines. Kathy Nobles will handle general information calls at 910/962-2490. To reach Spencer Rogers, coastal construction and engineering specialist, call 910/962-2491. To reach fisheries specialist Jim Bahen, call 910/962-2492. The office fax will be 910/962-2410.

E-mail addresses will remain the same: rogerssp@uncwil.edu or bahenj@uncwil.edu. Look for a tour of the new facility in a future *Coastwatch*.

In the meantime, "come visit," Rogers invites.

— K.M.

In the Next Issue of *Coastwatch*

The cold war against beach erosion is heating up. Efforts abound to renourish beaches that have lost tons of sand to not-so-gentle waves. Pam Smith looks at these proposals — and the funding sources — as well as arguments against such projects. Readers also will get a preview of *The Estuary's Gift*, a new cultural biography by Sea Grant researcher David Griffith of East Carolina University.

Rebach Joins North Carolina Sea Grant

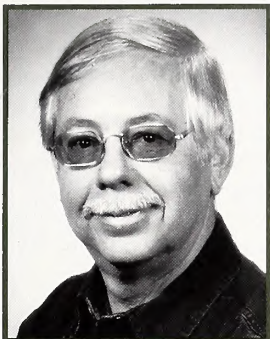
North Carolina's strong tradition of marine studies has drawn Steve Rebach from the University of Maryland Eastern Shore to North Carolina Sea Grant.

"North Carolina has always understood the importance of marine research," says Rebach, the program's new associate director for research. He will work with scientists from across the University of North Carolina system and Duke University to take marine research from theoretical levels to applied results.

"I want to encourage an even broader participation in Sea Grant research," says Rebach.

North Carolina Sea Grant Director Ron Hodson is pleased to have Rebach on board. "I am anxious to have him develop his own program and interact with the research community," he says. "I look forward to his leadership in program development."

Herman Landford



Rebach, who has a doctorate in biological oceanography from the Graduate School of Oceanography at the University of Rhode Island, had been at UM Eastern Shore since 1972. A biology professor, he chaired the Marine, Estuarine and Environmental Sciences Graduate Program at UM Eastern Shore and directed

the Crustacean Research in Ecology and Mariculture Institute.

His research has focused on crabs — a species with economic importance for both Maryland and North Carolina. His studies have shown how organisms make decisions regarding food selection and the sensory mechanisms used to find preferred food.

"Animals definitely will select food that smells like food, no matter what it looks like," he says.

Rebach's office will be in the Sea Grant headquarters at North Carolina State University.

— K.M.

Olson Heads to Washington, D.C.

Steve Olson, North Carolina Sea Grant's associate director for outreach, has been named director of governmental affairs for the American Zoo and Aquarium Association in Washington, D.C. He will monitor federal actions that affect the association's membership, which includes more than 200 facilities, from small city zoos and aquaria to large complexes such as Disney's Animal Kingdom, the San Diego Zoo and Wild Animal Park, and Sea World. The North Carolina Zoological Park and the three North Carolina Aquariums are also members.

"This was not an easy decision for me because I have learned a tremendous amount working with the dedicated staff at North Carolina Sea Grant and have enjoyed the wondrous beauty of this great state," Olson says. "But I have always wanted to work with the zoo/aquarium community.

This is an exciting opportunity to do so."

Olson is credited with bringing the Sea Grant extension and communication staffs closer under the umbrella title of outreach. His responsibilities increased in 1999 while Sea Grant Director Ron Hodson recovered from injuries sustained in a plane crash.

"He kept the program together," Hodson says. "He was a tremendous asset. We hate to see him go, but we wish him well."

Olson has worked in Washington before, as a Dean John A. Knauss Sea Grant fellow in 1987-88, and as director of marine and environmental affairs for the National Association of State Universities and Land Grant Colleges.

Steve Rebach, North Carolina Sea Grant associate director for research, will assume outreach duties on an interim basis.

— K.M.



Construction Begins for Shipwreck Museum

The turbulent waters off the Outer Banks represent one of the highest densities of shipwrecks in the nation — from Blackbeard's *Adventure* to the Civil War vessel *U.S.S. Monitor*.

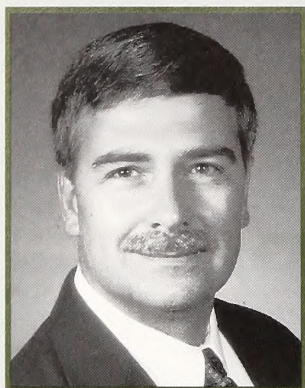
This maritime history and culture will be the focus of the Graveyard of the Atlantic Museum. Construction began in December on the museum, which is adjacent to the North Carolina Department of Transportation ferry terminal in Hatteras.

With its large wooden beams and graceful curved lines reminiscent of early ships, the 19,000 square-foot museum will recall the spirit and feel of seafaring vessels. The exhibits will focus on the history, mystery and legends of shipwrecks between 1524 and 1945, as well as early residents. The museum is expected to open in 2001. Visit the museum's Web site: www.GraveyardoftheAtlantic.com.

— A.G.

COASTAL TIDINGS

Sea Grant Researcher Receives DOT Grant to Restore Urban Stream



Hermin Landford

Green: New CMAST Director

The Center for Marine Science (CMAST) in Morehead City has a new resident director at its helm. David Green, associate professor of food science and extension seafood specialist at North Carolina State University, took over the position in January.

He replaces Thurman Grove, professor and department head of zoology at NC State.

Green has more than 14 years experience as director of the NC State Seafood Laboratory in Morehead and has a working relationship with university and coastal marine programs and community leaders. He also has conducted numerous applied research and marine extension projects for North Carolina Sea Grant.

Green will oversee the move this summer into the new CMAST facility on the campus of Carteret Community College.

The center will provide offices, classrooms and research space for NC State scientists and educators, Carteret Community College faculty and students, North Carolina Sea Grant extension staff, and Carteret County Cooperative Extension Service faculty and staff. —A.G.

Barbara Doll, water quality specialist with North Carolina Sea Grant, has received a \$1.6 million grant from the North Carolina Department of Transportation for the Rocky Branch restoration project she is spearheading. The creek runs more than a mile through the heart of the North Carolina State University campus and drains into Walnut Creek, a major tributary of the Neuse River. In 1978 the Division of Water Quality classified Rocky Branch as the state's most polluted urban stream.

Doll has collaborated closely with the university's Facilities Planning and Design Department to develop the design and secure funding for the \$4.6 million project. She says the grant, part of DOT's federal enhancement allocation, will give a major boost to the comprehensive plan. The goals are to stabilize the degraded stream, improve water quality, and build a greenway through the campus.

Expansion of the riparian corridor along the stream should improve water quality and increase habitat for urban wildlife, while the 6,100-foot greenway will provide recreation space and a transportation alternative.

The new grant will be used for greenway construction and landscaping and the

expansion of two key roadway crossings.

Ronald Hodson, North Carolina Sea Grant director, says "I am proud of Barbara's leadership in a project that could become a model for urban stream restoration. If there is one thing recent hurricane seasons taught us, it's that whatever we do upstream has an impact on what happens downstream along our rivers, in our estuaries and ultimately at our coast."

The Rocky Branch Project will employ natural channel design techniques and innovative stormwater controls that offer greater long-term stability.

Urban development has taken its toll on creeks, streams and rivers across the nation, Doll says. Parking lots, roads and rooftops cause stormwater to course through stream channels, causing the erosion of stream banks, which can contribute a large portion of sediment load in many stream systems.

Culvert pipe, concrete and riprap used to control erosion accelerates flow, often transferring erosion problems downstream.

The DOT grant augments more than \$1.8 million Doll helped secure to implement the project. It will take an additional \$1.1 million to complete the stream restoration component of the project. —P.S.

Four North Carolina Scholars Win

Four scholars from North Carolina are working in Washington, D.C., after being selected as 2000 Dean John A. Knauss Fellows. Created in 1979, the fellowship offers a unique educational experience to students with an interest in marine, ocean and Great Lakes resources, and in the national policy decisions affecting those resources.

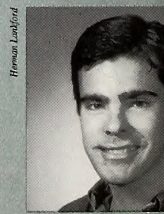
The fellowship, sponsored by the National Sea Grant College Program, matches highly qualified graduate students with hosts in the legislative or executive branches of the federal government.

North Carolina recipients are Tanya J. Dobrzynski, Matthew C. Huggler, Daniel Lyons and Elizabeth E. Nicholson.

Dobrzynski, who speaks Spanish, is completing a master's degree in environmental management at Duke University's Nicholas School of the Environment. Last summer, she served as a Marine Reserves Intern with the Environmental Defense Fund, researching social, economic and policy issues related to a national marine reserves policy initiative. Dobrzynski is assigned to the National Marine Fisheries Service, Office of Habitat Conservation.



Tanya J. Dobrzynski



Daniel Lyons

18 Fishery Resource Grants Awarded

Eighteen new projects have been selected for the North Carolina Fishery Resource Grant Program (FRG) in response to a second solicitation for proposals in 1999.

The grants, totaling over \$400,000, are diverse — ranging from studies on non-native catfish in the Cape Fear River to the impact of pesticides on blue crabs.

The FRG program was the first of its kind in the United States. Its premise is that innovative ideas for management of coastal resources are likely to arise from the intuition and knowledge of people who make a living on or near the water. The North Carolina program has been modeled by other states such as Virginia, which now has a similar program in place, and Georgia, which is considering its own program.

North Carolina Fishery Resource Grants target commercial and recreational fishers, seafood processors, and others either involved in fishing industries or who have participation or support from industry representatives.

Recipients often work along with academic researchers to increase the scientific validity of the projects,

fostering a valuable liaison between scientific and fishing communities.

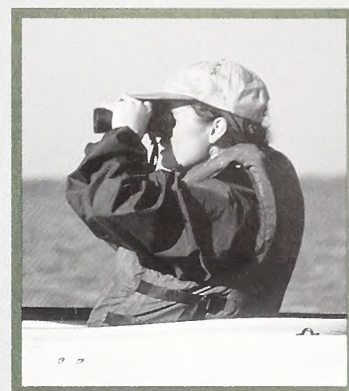
The N.C. General Assembly provides funds for the FRG program, which is administered by North Carolina Sea Grant. The legislature reformulated the grant selection committee in 1999 to include representatives from the N.C. Marine Fisheries Commission and its advisory panels, the N.C. Division of Marine Fisheries, and North Carolina Sea Grant.

Since the creation of the program in 1994, more than 170 projects from all regions of the North Carolina coast have been funded.

"I'm pleased with the outcome of the second solicitations and look forward to continued improvement of the FRG program for the upcoming year," says Steve Olson, former associate director for outreach for North Carolina Sea Grant.

Forty-six proposals for the FRG 2000 program were received in January. For more information, call the Sea Grant office in Raleigh at 919/515-2454, or check the Web at www.ncsu.edu/seagrant and follow the research link to the FRG pages.

— C.H.V.



Kate Mather

Participants Needed for Paddlers' Survey

The North Carolina Coastal Plain Paddle Trails Initiative is working with coastal communities to develop a paddle trail network for the state's coastal plain waters. The initiative is a partnership among North Carolina Sea Grant, the N.C. Division of Parks and Recreation, and the nonprofit Partnership for the Sounds.

To better understand paddlers' needs, the group is working with North Carolina State University to conduct a mail survey. The study will determine what attracts paddlers to eastern North Carolina, the infrastructure needed, and the economic impact of paddling activities.

Anyone who has kayaked or canoed in the coastal plain within the last year, can participate. Surveys will be sent to randomly selected persons on the database. Survey respondents will be eligible for a drawing for a free Wilderness Systems kayak.

To participate, call North Carolina Sea Grant coastal recreation and tourism specialist Jack Thigpen at 252/441-3663 or e-mail: jthigpen@pinn.net.

— A.G.

Prestigious Knauss Fellowships



Matthew C. Huggler

Huggler is completing a master's degree in environmental management at Duke's School of the Environment. His research focuses on the success of partnerships between the public and private sectors in preserving wetlands and estuaries. He is assigned to the House Resources Subcommittee on Wildlife, Fisheries and Oceans.

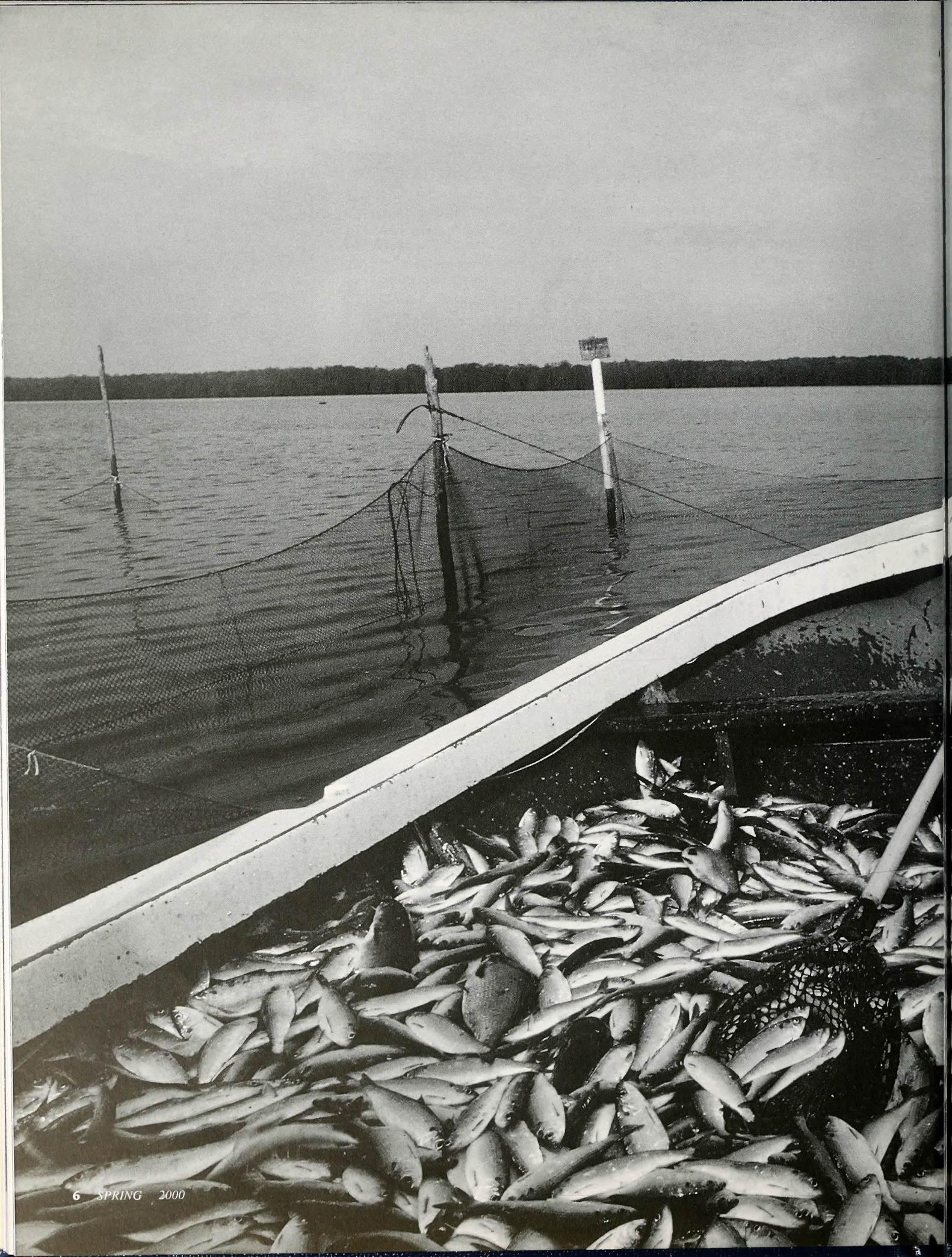
Lyons is pursuing two graduate degrees — a master's in regional planning at UNC-CH and a master's of environmental management at Duke's School of the Environment. He is the first student to work on both degrees simultaneously. He has been assigned to the Federal Emergency Management Agency.

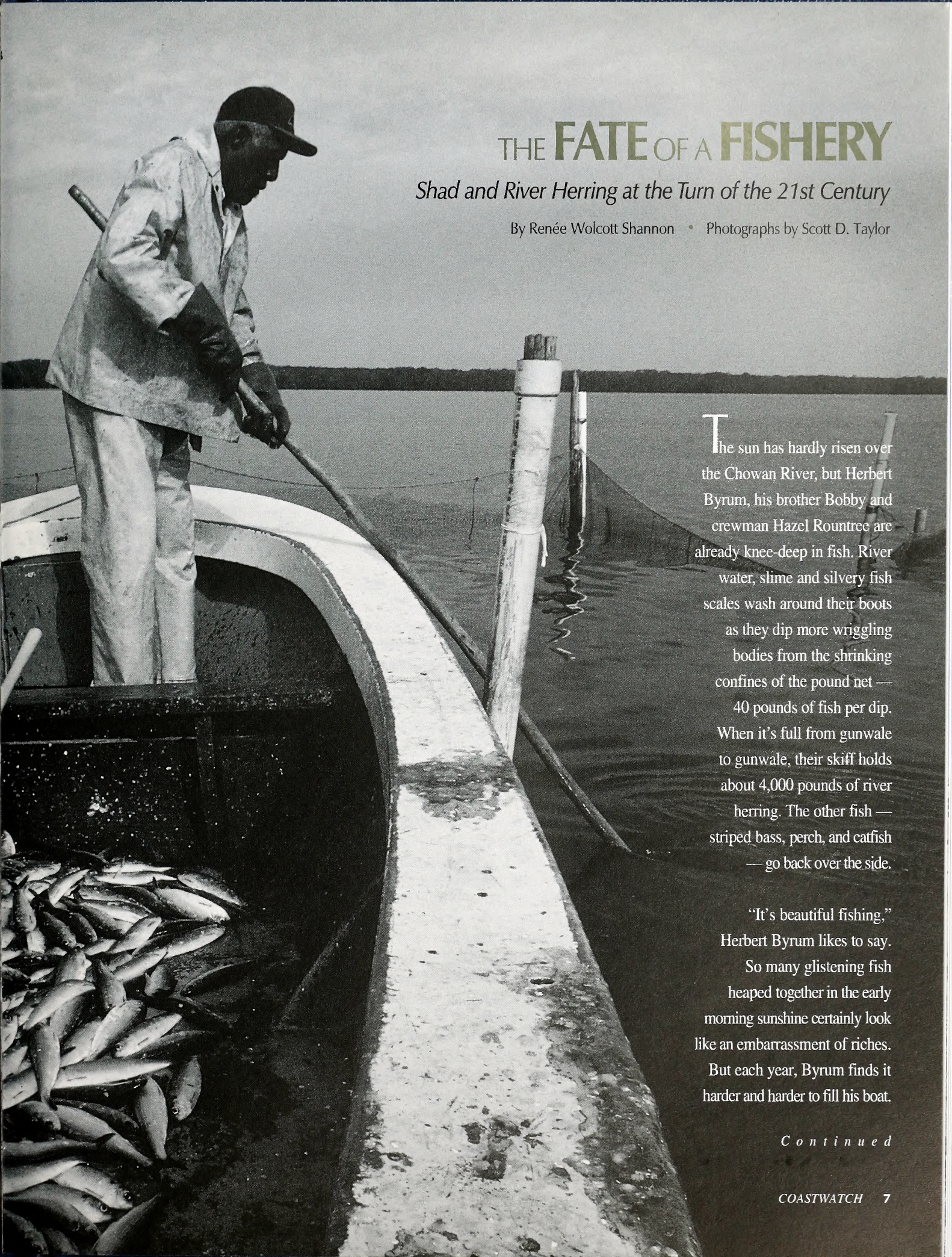


Elizabeth E. Nicholson

Elizabeth Nicholson is completing a master's degree in environmental management at Duke's School of the Environment. She is focusing her graduate studies on marine ecosystems and U.S. fishery policy. She has been assigned to the National Oceanic and Atmospheric Administration's National Ocean Service, Coastal Ocean Program, where she will be working on a national initiative on marine protected areas.

— A.G.





THE FATE OF A FISHERY

Shad and River Herring at the Turn of the 21st Century

By Renée Wolcott Shannon • Photographs by Scott D. Taylor

The sun has hardly risen over the Chowan River, but Herbert Byrum, his brother Bobby and crewman Hazel Rountree are already knee-deep in fish. River water, slime and silvery fish scales wash around their boots as they dip more wriggling bodies from the shrinking confines of the pound net — 40 pounds of fish per dip. When it's full from gunwale to gunwale, their skiff holds about 4,000 pounds of river herring. The other fish — striped bass, perch, and catfish — go back over the side.

"It's beautiful fishing," Herbert Byrum likes to say.

So many glistening fish heaped together in the early morning sunshine certainly look like an embarrassment of riches.

But each year, Byrum finds it harder and harder to fill his boat.

Continued



He has been fishing since 1964, when he was still in high school. River herring used to bring in three-quarters of his living. But as herring stocks have dwindled and N.C. Marine Fisheries Commission (MFC) regulations have become more and more stringent, his take-home pay from the fishery also has dried up. "Since 1994, it's been cut down to just over 20 percent from the restrictions," Byrum says. Where he used to catch up to \$40,000 worth of herring a year, he now catches \$10,000.

His father, grandfather and great-grandfather before him were commercial fishers. Like them, Byrum expects to keep fishing till he dies — but he doesn't expect anyone to follow in his footsteps. "I've enjoyed being a commercial fisherman, but I wouldn't want my kids to do it. They couldn't survive. Crabbing basically keeps us alive now."

A Shad AND Herring PRIMER

When North Carolina's dogwoods bloom, the first shad and herring can't be far behind, swimming up the rivers to spawn. First come the hickory shad in mid- to late-February, then the alewives in March. Bluebacks and American shad follow in three or four weeks. They are all anadromous fish that leave their salty ocean homes to seek spawning grounds

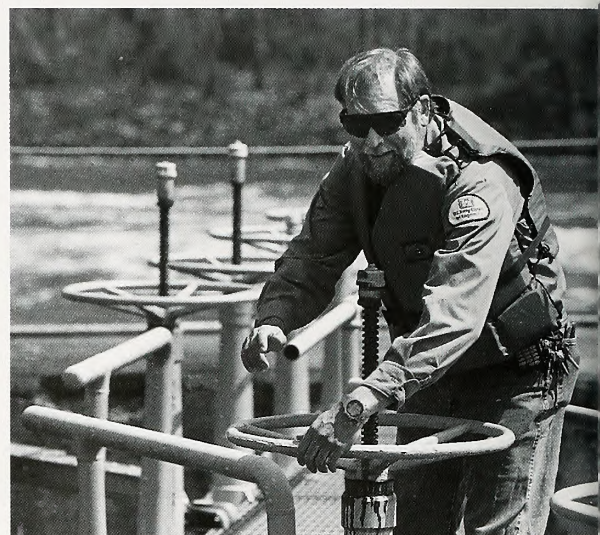
in the shallow freshwater creeks where they hatched.

When the first explorers and settlers arrived, they found rivers teeming with fish. In 1612, William Strachey noted "Shadds great store of a Yard long" in Chesapeake Bay, and "great Shoells of Herrings." In North Carolina, Algonquian Indians tended weirs across the streams. Settlers raided those weirs or built their own, and "kippered" the fish with smoke and salt much as their European forebears had done.

For generations, riverside communities celebrated this yearly provenance. The returning schools of shad and herring marked the end of each long, hungry winter and brought the promise of spring. Families scooped a year's worth of fish suppers from the water with nets and baskets of all kinds. Most shad were eaten immediately, as they didn't cure well with salt, but river herring could keep for a year or more if properly cut and brined.

In the 1760s, commercial fisheries were established on several of the state's rivers, and pickled herring were shipped up the coast to Baltimore, New York and Boston; west to the Great Plains; and south to the West Indies.

Two Dutch brothers introduced the pound net in 1869, vastly improving the efficiency of the herring fishery overnight. By the turn of the century, shad and herring numbers already were



dropping markedly. Technological innovations and industrial expansion were taking their toll in the form of over-fishing, pollution and the destruction of spawning grounds.

Still, North Carolina's fishing culture remained largely unchanged. Electricity and refrigeration were slow to spread to the remote eastern reaches of the state, and river herring remained one of the few meat sources poor families could afford. Until the mid-1900s, most households in eastern North Carolina would have a barrel of "corned" herring stashed somewhere in the kitchen.

Now the dependence on shad and herring is almost a memory. Though some bluebacks and alewives go to fish-packing plants for transformation into herring with cream sauce or other delicacies, most become fertilizer, fishmeal or bait. Shad are still a fairly valuable market fish, but their numbers have dropped so drastically that they are pursued mostly for sport.

Though commercial fishers are occasionally teased with an inexplicably good year, even the best years are nothing like the old days. The highest annual landings for river herring since 1887 came in 1969, with a haul of just under 20 million pounds. By 1990, the total landing was only 1.1 million pounds. For shad, the peak landing of 9 million pounds in 1897 has been replaced by annual catches of less than 400,000 pounds.



FROM LEFT TO RIGHT:

Martin County fishers dangle baskets from a bridge to catch herring, participating in a centuries-old tradition. Robin Hall opens the gate at Lock & Dam No. 1, ushering another school of shad to their upstream spawning grounds. Hazel Rountree takes a moment to relax after a long morning of pound-net fishing.

Since 1995, the MFC has regulated catches of both shad and river herring. Commercial ventures may take shad only from Jan. 1 through April 15, and there is a recreational creel limit of 10 fish per person per day. As regulators ponder a fishery management plan for river herring, temporary quotas slash the total allowable catch. The reduced quotas have forced some commercial fishing families out of business. Others, like Herbert Byrum, have diversified into fishing for crab, shrimp or catfish to make a living.

Last spring, I set out to find some vestige of the fishing culture that used to thrive along North Carolina's eastern rivers. It's mid-March as I leave Wilmington for a tour of three of the state's great fishing rivers: the Cape Fear, the Neuse and the Roanoke. Jim Bahen, a North Carolina Sea Grant fishery specialist, is my intrepid guide. If I'm lucky, I'll get glimpses of the fishery's lucrative past, and perhaps, of hope for the future.

LOCK & Dam No. 1, Cape Fear RIVER

The Cape Fear pours over the dam in a smooth brown curve, foaming white where it meets the lower water downstream. Bluffs rise on either side of the river. Along one bank, black rings in the grass mark the site of illicit midnight

bonfires and fresh fish dinners.

On the river's surface, a safe distance from the tumbling whitewater, men in bass boats and skiffs work the current with rod and reel or slow-moving drift nets. They're pulling in fat, white American shad, which are bigger than their hickory shad cousins.

"The net fishermen are happy about the muddy water," says Robin Hall, lockmaster at Lock & Dam No. 1. "Fish can't see the net, and they swim right into it."

Hall is popular with fishers, who call him from morning till night to find out how the river is running. He always knows. And thanks to him, many American and hickory shad are running the gauntlet of all those hooks and gill nets to find safe passage upriver through his lock.

Though boats have floated through the lock since 1915, fish present a greater problem. Shad can't leap over the dam, which rises 11 feet above the water — and they don't use the fish ladder. For years, Hall says, most fish pooled at the base of the dam, never reaching their upstream spawning grounds. "They'd swim in through the downstream gate, take one circle around the chamber, and go right out the gate again."

While U.S. Secretary of the Interior Bruce Babbitt leads a nationwide campaign to blow up unnecessary dams, Hall has taken a less explosive approach. With funding from the Fishery Resource

Grant program administered by North Carolina Sea Grant, Hall teamed with Mary Moser, a fish biologist formerly at the University of North Carolina at Wilmington, to study the movements of shad through the lock.

Radio signals from tagged fish confirmed his fears: Hardly any fish made it upstream during his usual locking procedures. But when he changed the arrangement of the gates and the flow of water inside the lock chamber, more fish stayed inside.

At the dam, we gather under a huge live oak tree to buckle on life preservers before venturing out onto the concrete beside the lock. The water curls far below us, the color of chocolate milk.

The new method for opening the gates creates a strong current flowing downstream along one side of the lock. Fish enter the lock and swim up the current until they hit the other end of the chamber. After circling back on the "quiet" side of the lock, they enter the current again and repeat the process instead of exiting on the downstream side. I watch the waves, hoping for a glimpse of a fish.

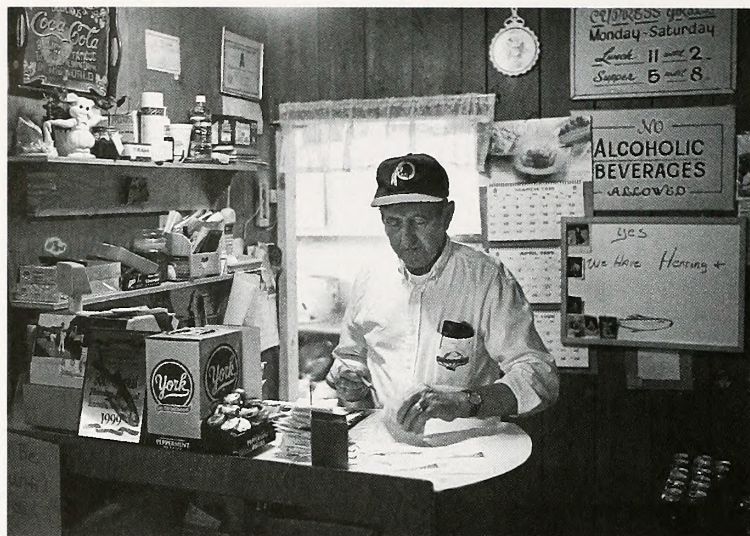
"There's hardly a ripple if a shad comes up," says Hall. "If there's a splash, it's more than likely a striped bass or blue catfish." But I can't see anything, even with Bahen's polarized sunglasses.

C o n t i n u e d

FROM LEFT TO RIGHT:

The small-town charm of Jamesville's Cypress Grill has made it a popular destination during herring season.

At Murray-Nixon fish company, baskets of herring await processing. Buckets hold dozens of fat catfish, bycatch from a heavy load of river herring.



Hall now performs three lockings a day during spawning season, just for the fish. In between, he leaves the gates open to attract more shad into the chamber. The U.S. Army Corps of Engineers, which operates the dam, has extended the same strategy to the two dams farther upstream. "Big schools of shad fry have been seen as far upriver as Fayetteville," Hall says proudly. "With the three-hour lockages ... 80 percent more fish are being passed upstream."

On that optimistic note, we head to the car. In the parking lot, families pack shad into buckets full of ice for the ride home. Some folks spare a few fish for their neighbors. Bahen says that many coastal plain residents still rely on shad for springtime dinners. "When the dogwoods bloom and the corn is about two inches high, these people know it's shad time," he says.

GRIFTON, Contentnea CREEK

It's already getting dark when we pull up outside the Grifton Country Store, a family business that caters to recreational fishers as well as road-weary drivers in need of a soda and snack. When we walk through the front door, I hear crickets chirping. A sink holds cardboard boxes full of bugs for bait, alongside the minnows and worms. One wall is ornamented with lures in plastic

bags: shad darts, spoons, and flies.

Our host Lubie McLawhorn, who owns the store with his wife Nettie, leads us into a back room. The smell of hot oil fills the small space, and on a counter, a line of pans holds floured fillets of trout, hickory shad, river herring, American shad and two kinds of roe. Master cook Allen Shirley is conducting a fish fry just for us. The secret, he says, is to add vinegar to the oil just before adding the fish. "It crystallizes the bones."

When the fish are hot, we fill plates with fillets, fried hunks of roe, potato salad and cole slaw. I've never eaten roe before, and roll the tiny firm grains across my tongue. Despite the vinegar, the herring and shad are crunchy with needle-sharp bones.

The locals eat the fish — bones and all — wrapped in white bread with ketchup. "If the bones catch in your throat, you swallow the bread and it catches in the bread and passes on through," McLawhorn tells me.

Stories around the smoky table focus on the good fishing. "The hottest spot is at the mouth of Contentnea Creek," McLawhorn says. "There's more (shad) in supply this year than any year I can remember. I've never seen a run like this before." This very day, in fact, a Greenville man brought in his catch to be weighed — a 3.8-pound hickory shad that tied the state record

established in 1992. I can't help but think of Strachey's yard-long shad, missing from these waters for centuries.

Anticipation is building for the Grifton Shad Festival, which started in 1971 to celebrate the town's long love affair with hickory shad. A sport fishery for shad has flourished on the Neuse River and Contentnea Creek since the 1800s, and the hook-and-line fishery continues to grow. While American shad and striped bass or rockfish were high-dollar, export fare for much of the 20th century, herring and hickory shad fed the locals.

Janet Hasely, a New York native, helped establish the festival to recognize the town's fishing heritage, and she continues to be its biggest promoter. She drops by after dinner to share some of the special "Mo Shad" merchandise, ranging from flags and T-shirts to jewelry. "Mo Shad," the Grifton mascot, is a bony hickory shad skeleton that appeared with the words "Eat Mo' Shad" on the town's old drawbridge.

The festival features prizes for the biggest and earliest shad catches of the season, a fish fry, a "shad toss" in which participants compete to see who can hurl a dead fish the farthest, and a casting contest with rod and reel. Arts and crafts booths, a "Shad Queen" contest, parade and street performances round out the festivities.

The annual event routinely draws about 10,000 out-of-town visitors, and McLawhorn appreciates the influx of sport



fishers. Amid rumors of the good shad run, business has been especially brisk. "I've ordered more fishing tackle in the last month than I usually sell in the whole spring."

The next morning, I try out some of that tackle. I spend a good 20 minutes figuring out how to cast into the current at the mouth of Contentnea Creek, as McLawhorn and Bahen duck and grimace behind me. Finally, after at least half an hour of ineffective casting — during which Bahen reels in three fish and McLawhorn, two — I get my first nibble. My line pulls hard to the right — my first fish ever.

If anything, the men are more excited than I am. Sadly, my first hickory shad disappears into the muddy water as I bring it alongside the boat. Bahen declares it a catch and release.

Even more determined, I flick the line out into the stream over and over. Around 11 a.m., as my casting wrist is getting numb, I pull a two-pound hickory roe shad over the side of the boat. Smiling proudly, I hold it all wrong for the camera.

There's a long road ahead with no refrigeration, but I wish I could pack up my fish and take it home to eat. I'm a child of grocery stores and fast food chains, and the only herring I'd eaten before yesterday came in a can with a peel-back lid. Self-sufficiency is a flavor I've never tasted. McLawhorn assures me that someone will enjoy my catch

and adds my shad to the others in the fish well. Then he guns the engines for a fast, cold ride back to the boat ramp.

JAMESVILLE, Roanoke RIVER

As we drive north, I scan the roadside canals for signs of fishing. In the old days, kids used to suspend bushel baskets from the bridges, waiting for telltale vibrations to travel up the ropes to their hands. A deft flick of the wrist, and up came the dripping basket with a few herring in it. Men and women would fish in the shallows with bow nets made from curved pieces of juniper and hand-knotted twine. When fish flooded the streams, a good bow net could trap more than 100 herring in a single dip.

In Jamesville, once home to three commercial fisheries, seine hauls were so heavy that horses had to pull them in. These are the kind of memories Jeff Phelps wants to preserve in a Jamesville museum. An outspoken member of the town board, he appreciates the proud local traditions of the river herring fishery. "Elders have told me that for hundreds of years, when the herring would come up the river, there was some kind of festival here. ... They'd have a seine all the way across the river and they'd crank them in. People would come down to the river in their Sunday dress to buy herring."

The herring run and the festival historically coincided with Easter Sunday and homecoming for local churches. The modern Jamesville Herring Festival is held on Easter Monday every year. For Phelps, a museum is the next logical step to recognize Jamesville's heritage. History buffs also could pull tourist dollars into an economically depressed county.

He hopes to open a temporary museum in the town hall, displaying old photographs of the fishery. If his dreams become reality, a permanent museum will be housed in the Burras House someday. "It's the oldest building in town, established around 1790," Phelps says. "All the rest of the buildings were burned in the Civil War." The museum could include Civil War-era artifacts and relics of the fishery. Phelps would also like to see Jamesville get a public boat ramp — something inexplicably missing from a town so defined by its relationship with the river.

Jamesville is so renowned for its herring that it boasts the Cypress Grill, a weather-beaten restaurant open only between January and May. What's on the menu? Herring, herring and herring. People drive from all over the state to eat there, and at the neighboring River's Edge Restaurant. But when we arrive in town and drive to the parking lot overlooking the water, we find both

Continued



restaurants closed and few people on the water.

McLawhorn had warned us that herring had been scarce in the Roanoke River. "The dams should be opened ... they're holding the fish back. They need to turn loose the water." Upstream from Jamesville, at Lake Gaston, the U.S. Army Corps of Engineers operates dams that control the water levels in the river system, and the 1999 springtime drought has meant low flow for months. Salt water has pushed far inland, and fishers worry that herring aren't getting the signals they need to push upriver to spawn.

"What are you catching?" I ask veteran fishers on the riverbank. They're selling a handful of river herring from a waxed cardboard box in the back of a pickup truck.

"Mostly rock," they tell me. Striped bass have made an amazing comeback from dangerously low levels a decade ago, and their catch is still highly regulated.

One of the fishers, Billy Williams, argues that similar state regulations are killing the commercial herring fishery. "They've cut us down to 100,000 pounds of fish for the Roanoke and Albemarle," he says. "We'll never catch any more fish."

Vance Price nods. "Three or four years ago, you caught 1,200 fish in one drift," he says. This year, the fishers' nets come up almost empty.

TAKING Stock

Herbert Byrum's back yard slopes right down to a branch of the Chowan River. Between his place and his brother's is a fish house where they unload their catch onto conveyor belts and into the backs of trucks bound for Perry-Wynns or Murray-Nixon fish company. "We got through Floyd pretty good," Byrum says, long after the 1999 spring run is over. "It tore up our piers and our unloading conveyor ... There was probably two and a half to three feet of water in the fish house."

Far more devastating was 1999's low catch of herring. "We did a little sorrier up here than we generally do," Byrum says. "The rock are taking 'em. They stayed in the south end of the river." He estimates that he caught 5,000 to 10,000 pounds of herring a day and up to 6,000 pounds of striped bass, though he could only keep 10 of the rockfish per day due to MFC regulations.

It's a far cry from the 1930s, when farmers in the area would come to the river to buy a year's worth of herring for their tenants. In more recent times, Byrum has faced several adversaries in the fight to keep the river herring fishery alive. Ditching and draining of the river's tributaries for agriculture destroyed some herring spawning grounds. In the 1970s and 1980s, pollution from upstream industries and runoff from agriculture turned the

Chowan River into a green soup of algae and dead fish.

Massive cleanup efforts that began in the 1980s have resulted in improved striped bass and white perch fisheries and decreased incidences of algal blooms. But now that the water quality is back, years of over-fishing are taking their toll. The state has enacted strict rules to protect river herring stocks and let their numbers rebound, but to many struggling commercial fishers, the regulations curbing their industry are anathema. Fishers who work the inland waters must comply with regulations set by the N.C. Wildlife Resources Commission, while coastal waters are regulated by the Marine Fisheries Commission.

Sara Winslow, fish biologist with the N.C. Division of Marine Fisheries (DMF), explains the rationale behind the 1999 regulations, which reduced the quota for the river herring fishery to 450,000 pounds. The quota was subdivided to include 300,000 pounds from the Chowan pound-net fishery; 100,000 pounds from the Albemarle gill-net fishery, which includes the Roanoke River; and 50,000 pounds that could be assigned at the DMF director's discretion.

"River herring stocks are still over-fished and populations are at extremely low levels," Winslow says. "The number of spawners in the population is very low." Stock assessment analyses



FROM LEFT TO RIGHT:

Renée Shannon joins Grifton locals for an authentic fish fry at the Country Store.

Workers unload fish from the conveyor belt at Herbert Byrum's fish house.

Fried herring at the Cypress Grill is a springtime tradition.

also show that the number of recruits — fish that reach sexual maturity and return — is also very low.

Each year, the DMF samples the river herring harvest to assess the overall stock. Most of the herring harvested are 3 to 5 years old — usually first-time spawners — suggesting that the older ones have been fished out. Younger fish are still in the ocean, maturing before they spawn for the first time. "We want to see a wide span of age classes represented in a harvest," Winslow says. "For the last 10 years, the majority of the harvest is from one- to three-year classes." In the 1970s, up to eight-year classes were represented.

In February, the Marine Fisheries Commission adopted a Fishery Management Plan for river herring. The plan limits the commercial herring fishery to 300,000 pounds per year. That total allowable catch is divided into three portions: 200,000 pounds for the pound-net fishery on the Chowan; 67,000 pounds for gill nets in the Albemarle Sound herring management area; and 33,000 pounds that the DMF director can assign. With the new limits, the division expects it will take 14 to 24 years for the river herring fishery to recover.

The commission also instituted a new cap or daily creel limit of 25 river herring for recreational anglers.

The final herring management plan vote came after criticism of an earlier

proposal that would have limited river herring to a 100,000-pound bycatch fishery. Under that plan, herring would only be harvested incidentally, as a limited "bycatch" when fishing for other species.

Byrum was among a group of fishers who thought the bycatch proposal would result in wasted fish. "If it's a 25 percent bycatch, you'll have to catch 100 pounds of white perch and catfish before you can take in 25 pounds of herring." Since a pound net holds 5,000 pounds of fish, if the rest of the fish are herring, they'll have to be thrown back. And herring just aren't the same after being squeezed in a tight net with a lot of other fish. "That's 4,875 pounds of herring that will die and get thrown away," Byrum says. "That's stupid. Herring is a fragile fish. If you bunch it up, it'll die."

The 300,000-pound limit was approved after the Marine Fisheries Commission again heard from the co-chairs of an advisory panel for the river herring management plan. The panel had recommended a total catch of 450,000 pounds. Jerry Schill, president of the North Carolina Fisheries Association, says he was pleased that advisors had a chance to present their proposal again.

There may be no simple solutions for the recovery of these fisheries. Shad and river herring are more than fine-tasting, silvery fish that swim up North Carolina's rivers every spring, pulled by

forces we neither see nor feel. For generations of hard-working citizens — often the state's poorest and most invisible people — they have been gifts from the river, a seemingly endless bounty that created jobs, traditions, and plenty in the midst of want.

If the numbers of shad and herring continue to dwindle, a part of North Carolina heritage vanishes with them: three centuries of town reunions on the riverbank, baked shad at Easter, fresh herring at the Cypress Grill, 5,000 pounds of fragile fish flashing in a net.

As Byrum says, it's beautiful fishing. ■

EDITOR'S Note:

Much of the historical information for this story is drawn from the master's thesis of Charles L. Heath Jr., "A Cultural History of River Herring and Shad Fisheries in Eastern North Carolina: The Prehistoric Period through the Twentieth Century," prepared in 1997 for the East Carolina University anthropology department.

FISH Festivals:

The Grifton Shad Festival will be held April 8-9. Call Janet Haseley at 252/524-4356 for more information. The Jamesville Herring Festival will be held April 24. For information, call 252/792-5006.



The family-run Harris Net Shop in Atlantic stitches nets for shrimp trawlers in North Carolina and other states.

A Stitch in Time



NETMAKING IS BECOMING A LOST ART

By Ann Green • Photos by Scott D. Taylor

Inside a large building stacked with piles of webbing, Heidi Roberts whips a long needle in and out of a shrimp net so fast that her head bobs in a rhythmic fashion.

Her father, Roger Harris, and brother, Bubba Harris, work beside her stitching a 36-foot net for a shrimp trawl. In the back, another brother, Kerry Harris, hangs a net on a line for a crab trawl.

Each day, the family practices the time-honored craft of netmaking at Harris Net Shop in Atlantic. The work is tedious and precise, requiring the hand sewing of each net. Harris has callouses on his hands from more than 30 years of stitching nets.

"Netmaking is like woodcarving," says Roger Harris, who carves duck decoys as a hobby. "It is a God-given talent. Not everyone understands it."

Continued



Kerry Harris splices a cable for a crab trawl.

The Harris family is in a profession that is highly specialized and slowly fading away. In North Carolina, there are about a half dozen full-time net shops. South Carolina and Georgia have even fewer.

"It is getting to be a lost art," says Nicky Harvey of Harvey & Sons Net Shop in Davis, which boasts dozens of crab pots. "We used to stay busy doing nets year-round. Now half of our net business is gone. We are surviving by selling crab pots. Seventy-five percent of our business is crab pots."

Most netmakers attribute the decreasing demand for nets to the growing number of state and federal regulations for commercial fishers. In North Carolina, there are specific requirements for fixed, gill, trawl, channel and pound nets and seines that are used to encircle fish and close all escape routes. Regulations also limit nets pulled by more than one boat and those used in long-haul fishing operations.

The regulations include mesh size, the diamond-shaped hole in the webbing. A net with large netting will hold only big fish. To catch a smaller fish, a smaller mesh is needed.

In 1992, North Carolina became the first state to require

bycatch-reduction devices (BRDs) in shrimp trawls. The devices allow juvenile or small fish to escape via openings in the trawl nets, allowing fishers to keep mature fish and shrimp.

"Netting is going down the tubes like fishing," says Heidi Roberts. "It looks like they are putting more and more restrictions on fishing."

Not everyone's business has declined because of the new regulations. Melvin Shepard of New River Nets in Sneads Ferry has diversified his business — selling outdoor wear as well as nets.

"The fishing industry is alive and well," says Shepard. "In the 20 years that I have been in business, every year has been better than the year before. We take care of recreational and commercial fishermen."

Recently, the debate over netting regulations has intensified between commercial fishers and sportsfishers. Texas has banned all gill nets. Louisiana restricts the use of gill nets, trammels or entanglement nets and seines in salt water, except for special permitted fishers during certain seasons. Florida has banned all gill nets and the use of monofilament — also used in fishing lines — for all except hand-held nets.

In North Carolina, the Wildlife Resources Commission is proposing a gill-net ban for inland waters.

In December, the National Marine Fisheries Service



Melvin Shepard attaches a shrimp trawl to trawl doors outside his Sneads Ferry shop.



Chandler Harris plays near stacks of webbing.

closed off part of Pamlico Sound to fishing with gill nets with a mesh greater than five inches. The area was shut off for a month because of the strandings of 74 sea turtles in the sound — 23 loggerheads, 12 green turtles and 39 endangered Kemp's ridley sea turtles.

After the closing, the Coastal Conservation Association of North Carolina (CCA-NC), which has more than 8,000 members including some salt water recreational fishers, requested that the Marine Fisheries Commission establish a fisheries management plan for all gill nets in state waters.

"Under the Fisheries Reform Act, the state is required to manage fisheries by stock, region or gear," says the association's executive director Jay Kriss. "North Carolina hasn't attempted to manage fishing gear. Gill nets are an effective commercial gear. We don't want to ban nets. We want to manage how long nets are in the water and where they are set to secure bycatch reduction." Now, he says, the bulk of gill nets are set out and left for days on end, often without being checked by fishers.

However, Jerry Schill of the N.C. Fisheries Association

disagrees. "Gills nets are not indiscriminate. They can be very species- and size-selective, even more so than a hook and line."

Marine Fisheries Commission Chairperson Jimmy Johnson says once the fishery management plans — which are species-specific and include management options for gill nets — are completed, it will be easier to look at a holistic gill-net plan.

"It would be difficult to do a gill-net plan for the whole state because our fisheries are so diverse," he adds. "However, we could do a special gill-net plan for specific bodies of water, including the Pamlico and Albemarle sounds and the Pamlico and Neuse rivers."

Net Traditions

Netmaking is as old as the fishing industry. Years ago, fishers would weave nets in their backyards.

One legend has it that Kerosene John in Southport made the first shrimp net, according to Harris.

C o n t i n u e d

In the early days, nets were made of cotton or other natural fibers. With the industrial revolution, cotton webbing became mechanized. Prior to this, fibers were spun to twine, and the twine was knotted into webbing by fishers.

"I remember fishing with my Dad," says Shepard. "He would take a cotton or linen net and spread it out on two poles to dry out so it wouldn't rot."

With the invention of synthetic fibers, netmakers switched from cotton to nylon, polyethylene or spectra. The synthetic material comes in bales from the factory.

"New fabrics like spectra are high in strength and small in



Roger Harris learned the basics of netmaking by sewing menhaden nets in Louisiana.



At bottom, Bubba Harris works on a shrimp trawl, while the shop mascot takes a rest.

diameter," says Steve Parrish, who runs a net shop with his wife, Sabrina, in Brunswick County. "The new fabric also allows you to pull nets faster through the water."

Parrish learned the netmaking trade from his wife's grandfather, Crawford Fulford.

"He encouraged me and shared his knowledge with me," says Parrish. "He had done netmaking for 50 or 60 years."

It took Parrish several years to perfect the craft. "It takes five to 10 years to become proficient and fast at netmaking."

Grand Net Variety

Nets are tailored to differentiate between species of fish and shellfish. Shrimp nets can be cut and hung to distinguish between pink, white and brown shrimp.

The netmaker also needs to know the size of the boat, the horsepower of the boat's engine, the number of nets and the water depth.

"There are as many ideas about making nets as there are fishermen," says North Carolina Sea Grant fisheries specialist Bob Hines.

Most of the time, the fisher develops his specifications for the net. Then the netmaker makes the design.

Harris has dozens of patterns stuffed in a small tin box. "Some patterns are in my head, and some are in the box."

After designing the net, Harris cuts the net on a taper and sews it together. Fishers use one, two or four nets on shrimp trawls.

"Sewing a shrimp trawl is like a woman making a dress," says Harris. "We've got yards and yards of cloth. People make all sizes of dresses. We make all sizes of nets."

When the stitching is complete, Harris hangs the nets on a line inside. Then he puts the nets together in a funnel shape and adds a trap door, a turtle excluder device and a BRD.

Besides shrimp trawls, netmakers whip up a variety of nets for different species of fish — from gill nets to pound nets. Longer nets are hung outside on lines or between trees.

The nets vary in size from a small 3-foot try net used by shrimpers to test the catch in the water to gill nets thousands of feet long.

“When setting for flounder, it is not unusual for a fisherman to have set 2,000 to 3,000 yards of net,” says Shepard. “In hunting mullet, you might have a net that can be 20 feet deep by 500 yards long.”

A netmaker’s business is built on reputation. “Fishermen



Bubba Harris (at left) and his father, Roger Harris, work side-by-side each day.

are on the water working and talking,” says North Carolina Sea Grant fisheries specialist Jim Bahen. “They are always competing. They talk about the best nets like a truck driver talks about the best trucks. If a net is not catching well, the fisherman will be critical of the net shop.”

When a reputation is established, fishers from all over the country write or call a netmaker about buying nets.

“I make nets for people wherever there is shrimping — in Mexico, South America and from Virginia to Texas,” says Parrish.

However, he says even a high quality net won’t help an inexperienced fisher know what to catch. “You can have the best net, but you won’t catch any fish if the fisherman isn’t any good.”

Some netmakers say times have changed.

“My shops used to be lined with nets summer and winter for ocean-going boats,” says Harvey. “The business is getting worse and worse. If Roger Harris and I got out, don’t know what will happen. But I am going to keep fighting and fighting.” ■

NET KNOWLEDGE

By Ann Green

Most people think of a commercial fishing net as a simple mesh device that can be used to catch any type of fish. However, nets vary according to the type of fish caught. Here are some common nets used by fishers in North Carolina waters.

Gill net is versatile and can be used to catch a variety of fish — from trout to hake and flounder. These nets have openings large enough to allow a fish’s head to pass but not its body. When the fish tries to back out of the webbing, it is caught behind the gills.

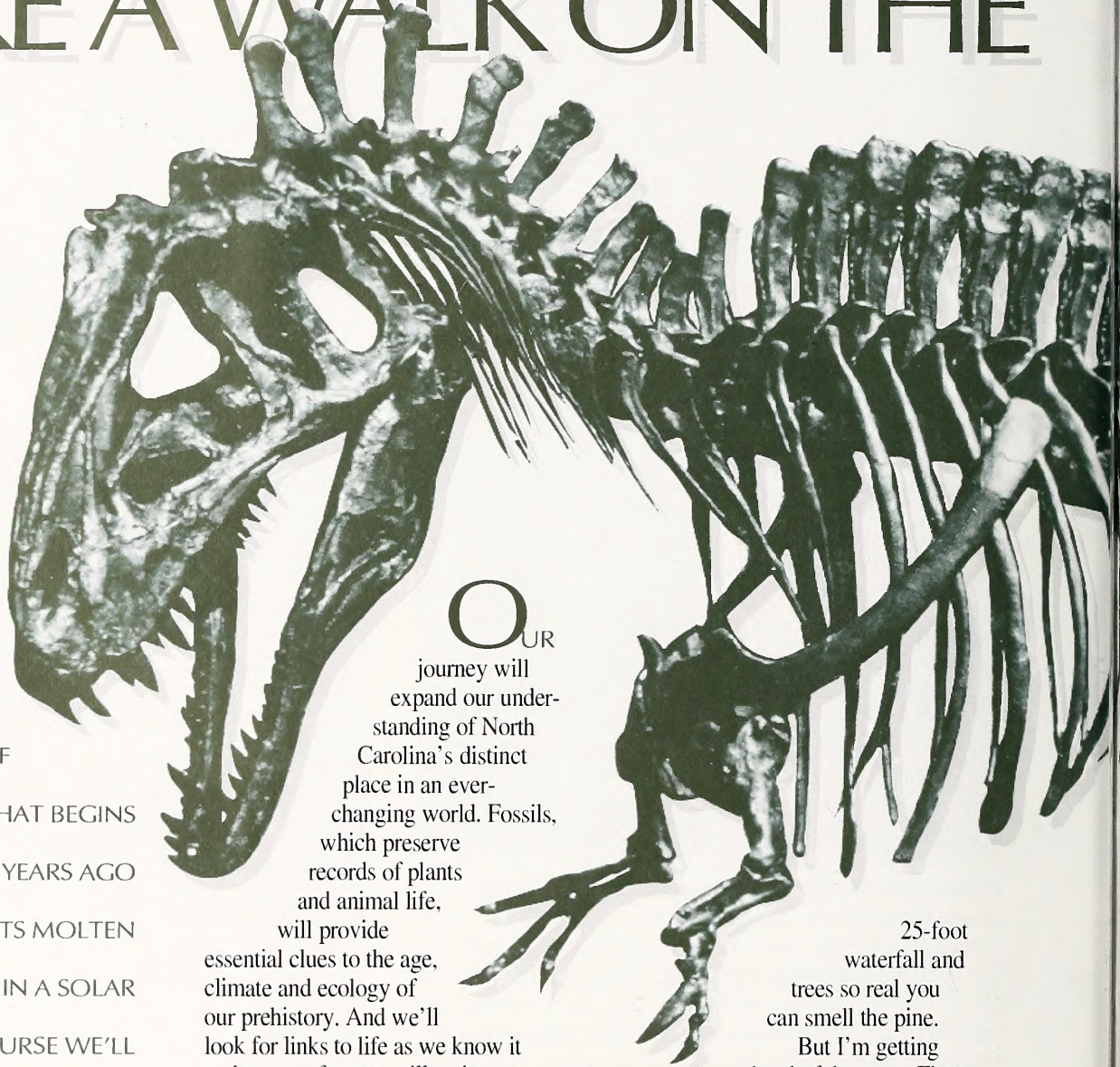
Pound net is intricate and has three sections: the leader, the heart and the pound. The leader is a long expanse of webbing that extends to the shore and bars fish from swimming downstream, directing them toward the heart — the funnel that channels fish into the pound. Also called a trap, a pound is a webbed box with no top and no means of escape for the shad, herring or flounder that swim into its midst.

Seine is used to encircle fish and close all escape routes. The circle of net is pulled smaller and smaller until the trapped fish are concentrated.

Trawl is a flattened, cone-shaped net that is lowered to the ocean or sound bottom and dragged along by the power of a boat. Shellfish or fish are swept into the mouth of the net and pile up at the cod or back end. In North Carolina, a bycatch-reduction device and a turtle excluder are required.

Fishers may tow from one to four trawls behind their vessels. Periodically, the trawl is winched aboard the board to empty the catch. Trawls can be rigged to catch shrimp, crabs, flounder, spot, croaker and squid. ■

TAKE A WALK ON THE



PREPARE TO
EMBARK ON A
JOURNEY OF
DISCOVERY THAT BEGINS
BILLIONS OF YEARS AGO
AS EARTH TAKES ITS MOLTEN
SHAPE WITHIN A SOLAR
SYSTEM. THE COURSE WE'LL
FOLLOW TWISTS AND TURNS
TO ACCOMMODATE THE
TECTONIC REARRANGEMENT
OF CONTINENTS IN
ALTERNATING PERIODS OF
DRAMATIC UPLIFT AND
BARELY DISCERNIBLE DRIFT.

OUR
journey will
expand our under-
standing of North
Carolina's distinct
place in an ever-
changing world. Fossils,
which preserve
records of plants
and animal life,
will provide
essential clues to the age,
climate and ecology of
our prehistory. And we'll
look for links to life as we know it
at the start of a new millennium.

This adventure through time is no
figment of a science fiction writer's
imagination. The time portal opens in
April with the inauguration of the new
North Carolina Museum of Natural
Sciences in Raleigh.

The seven-story, state-of-the-art
facility is the largest natural history
museum in the Southeast and boasts
exhibits seen nowhere else. Engaging
dioramas allow visitors to interact with
each diverse environment from the
sea to the mountains, complete with a

25-foot
waterfall and
trees so real you
can smell the pine.

But I'm getting
ahead of the story. First,
we'll catch up with Vince

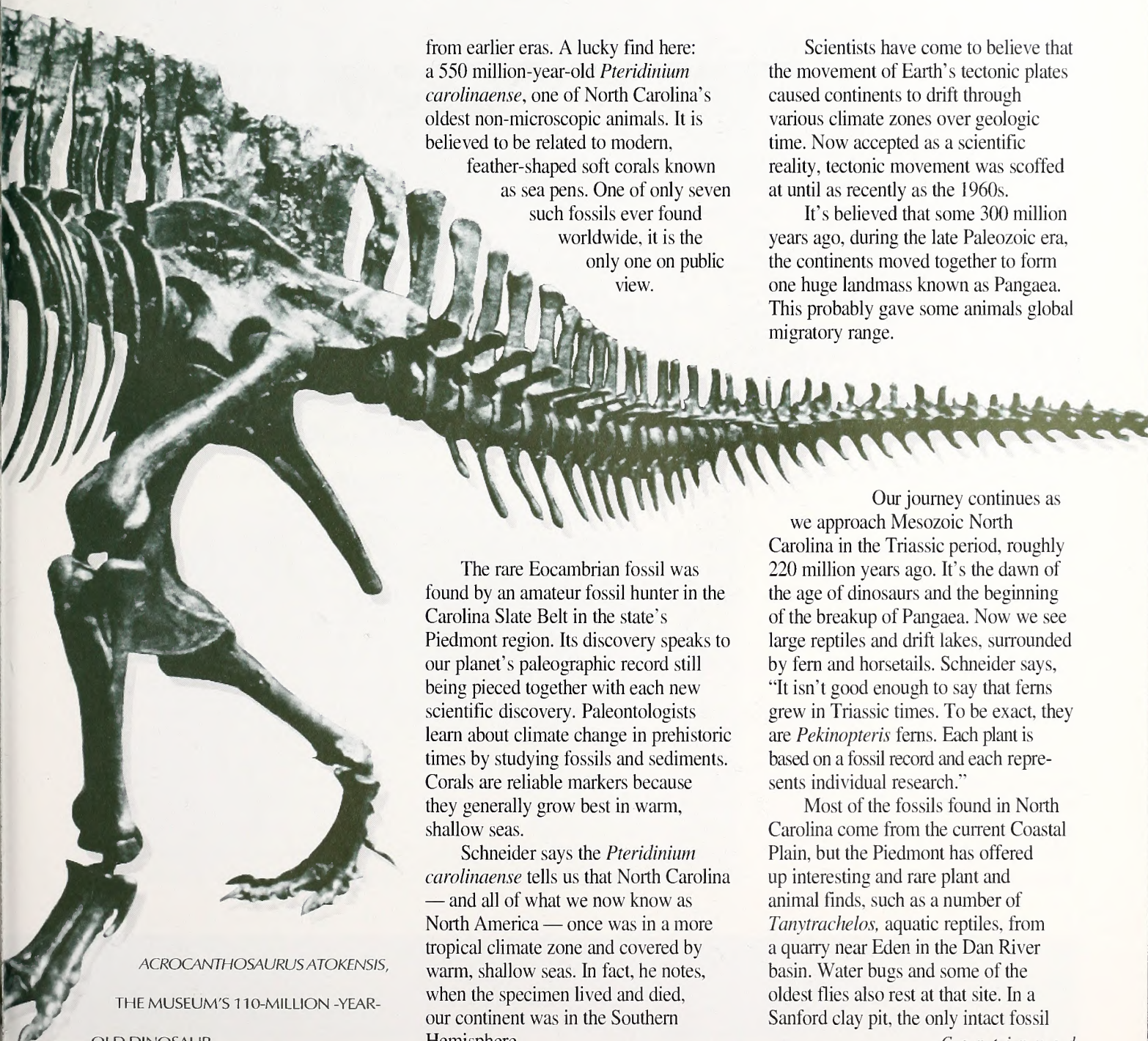
Schneider, museum curator of paleontol-
ogy, who will guide us as we tour North
Carolina at the dawn of life. We'll
encounter dinosaurs that didn't make the
evolutionary cut, and whales that did.

Step carefully into the "Prehistoric
North Carolina" exhibit, where a point
on the timeline mural virtually explodes
into life.

We'll follow the timeline through
the primordial soup as life coalesces and
primitive algae and bacteria leave traces

WILD SIDE

By Pam Smith



from earlier eras. A lucky find here: a 550 million-year-old *Pteridinium carolinaense*, one of North Carolina's oldest non-microscopic animals. It is believed to be related to modern,

feather-shaped soft corals known as sea pens. One of only seven such fossils ever found worldwide, it is the only one on public view.

The rare Eocambrian fossil was found by an amateur fossil hunter in the Carolina Slate Belt in the state's Piedmont region. Its discovery speaks to our planet's paleographic record still being pieced together with each new scientific discovery. Paleontologists learn about climate change in prehistoric times by studying fossils and sediments. Corals are reliable markers because they generally grow best in warm, shallow seas.

Schneider says the *Pteridinium carolinaense* tells us that North Carolina — and all of what we now know as North America — once was in a more tropical climate zone and covered by warm, shallow seas. In fact, he notes, when the specimen lived and died, our continent was in the Southern Hemisphere.

Scientists have come to believe that the movement of Earth's tectonic plates caused continents to drift through various climate zones over geologic time. Now accepted as a scientific reality, tectonic movement was scoffed at until as recently as the 1960s.

It's believed that some 300 million years ago, during the late Paleozoic era, the continents moved together to form one huge landmass known as Pangaea. This probably gave some animals global migratory range.

Our journey continues as we approach Mesozoic North Carolina in the Triassic period, roughly 220 million years ago. It's the dawn of the age of dinosaurs and the beginning of the breakup of Pangaea. Now we see large reptiles and drift lakes, surrounded by fern and horsetails. Schneider says, "It isn't good enough to say that ferns grew in Triassic times. To be exact, they are *Pekinopteris* ferns. Each plant is based on a fossil record and each represents individual research."

Most of the fossils found in North Carolina come from the current Coastal Plain, but the Piedmont has offered up interesting and rare plant and animal finds, such as a number of *Tanytrachelos*, aquatic reptiles, from a quarry near Eden in the Dan River basin. Water bugs and some of the oldest flies also rest at that site. In a Sanford clay pit, the only intact fossil

Continued

ACROCANTHOSAURUS ATOKENSIS,

THE MUSEUM'S 110-MILLION-YEAR-
OLD DINOSAUR.



Courtesy of the N.C. Museum of Natural Sciences

VINCE SCHNEIDER SHOWS OFF A SMALL PORTION OF THE MUSEUM'S EXTENSIVE MARINE FOSSIL COLLECTION.

of *Leptocyas gracilis*, an extinct sago palm, was discovered. As we linger in the Triassic period, Schneider points out a phytosaur, discovered in a Lee County coal mine, and the skeletal cast of a rauisuchid, a forerunner of the crocodile.

Moving into the Jurassic period, we notice the appearance of birds and mammals with dinosaurs. A mural shows the branching lines of dinosaur evolution. By the end of the Jurassic period, the Mid-Atlantic suboceanic ridge ruptures Pangaea into two land masses, setting into geologic motion

the drift of continents toward their modern positions over the following 150 million years.

THE CRETACEOUS ON THE CAPE FEAR

When we reach the Cretaceous period at a location on the banks of the ancestral Cape Fear River, the scene is abundant with sights and sounds. An *Albertosaurus*, a tyrannosaurid, crashes through the forest to attack a defenseless *Edmontosaurus*, a duckbill, guarding her nest of hatchlings. Primitive cypress, sycamore and magnolia trees, with leaf

patterns and structure too real to be fabrications, provide a natural ecological setting that is complete with soft shell turtles, birds, small animals and pesky dung beetles.

"Willo," said to be the most complete *Thescelosaurus* ever found, has a special place here. Perhaps it's a way to thank the small, swine-like herbivore for putting up with scientific probing to unlock its biological secrets buried millions of years ago in South Dakota. The results of MRI and CAT scans, isotopic bone studies and other scientific assays, will provide the basis

TRIASSIC PERIOD			JURASSIC PERIOD				EARLY CRETACEOUS			
250 million				200 million				150 million		
MESOZOIC ERA										

for an article in a major professional journal. It is one example of the museum's ongoing collaborative research with universities and institutions around the world.

Exploration and research has been stepped up in recent years, in part prompted by public interest and support. Schneider, a museum volunteer for more than 16 years, became the museum's first full-time curator of paleontology about five years ago. At the same time, Dale Russell, a renowned dinosaur researcher, accepted a joint position with the museum and North Carolina State University.

The partnership offers new possibilities for discovery and interpretation of untapped natural treasures beneath the state's expansive Coastal Plain. Participants of museum-led field

studies probe surface sediments rich in Cretaceous deposits along the Cape Fear, and other riverbeds, mines and quarries that are abundant with marine and river fossils.

Importantly, the new museum provides ample space for fossil laboratories and collections. Until recently, important finds often went to other museums, including Smithsonian's National Museum of Natural History, where the first dinosaur bones unearthed in North Carolina in 1869 reside.

Now, lightening, thunder and the screeches of winged reptiles heighten our sense of danger as we move deeper along the Cretaceous path toward the great fossil hall. Raptor-like dinosaurs peer anxiously from mangrove ferns into the "Terror of the South" exhibit.

Suddenly, we encounter

Acrocanthosaurus atokensis, the museum's 110 million-year-old predatory dinosaur, fully engaged in an unmerciful attack on a towering *Pleurocoelus*, a plant-eating sauropod. The fearsome scene follows an actual prehistoric attack "scripted" by fossilized dinosaur footprints, Schneider says. Casts of those prints are incorporated in the scientifically accurate recreation.

"Acro," the most complete specimen of its kind, was found in Oklahoma and purchased for the museum collection in 1997. The early Cretaceous monster lived nearly 45 million years before *Tyrannosaurus rex*, was the only giant North American carnivore of its time, and ranged across low, coastal plains from Texas to Maryland. The "high-spined" lizard is the centerpiece of the museum's impressive collection of dinosaurs that roamed North Carolina's prehistoric coastal environments for millions of years.

As we walk around and under the awesome "Acro" and compare our shoe size with the mighty prints, we imagine the sudden cataclysmic force that caused these giants to disappear from Earth's horizon.

Continued

WILLO IS SAID TO BE THE MOST COMPLETE *THESCÉLOSAURUS* EVER FOUND. THE SMALL SWINE-LIKE HERBIVORE WAS BURIED MILLIONS OF YEARS AGO IN SOUTH DAKOTA.



Courtesy of the N.C. Museum of Natural Sciences

LATE CRETACEOUS PERIOD				TERTIARY PERIOD				QUATERNARY	
	100 million				50 million				PRESENT
CENOZOIC ERA (includes Paleocene, Eocene, Pliocene and Holocene Epochs)									

A WHALE OF A STORY

Unlike dinosaurs that “went missing” some 65 million years ago, whales tell a story of evolutionary opportunism, Schneider says. “It’s an amazing story that couldn’t have been told until 20 or 30 years ago when exploration in India and Pakistan turned up fossils of *Ambulocetus natans* (swimming walking whale), an early ancestor of modern whales,” he says. Scientists determined that this amphibious species was the whale’s intermediate evolutionary link. Not long afterward in Pakistan, scientists discovered *Rhodocetus kasrani*, and labeled it the “transitional whale” because its adapted, flexible spinal column is suitable for swimming like a whale.

“Now we have nearly a complete picture of almost all steps of its evolutionary progression from being a land-based mesonychid to becoming the largest creature in the sea,” Schneider says, hinting at what is still to come as we move toward a simulated prehistoric aquarium filled with vaguely familiar marine life.

The underwater time tunnel plunges us into North Carolina’s Eocene epoch ocean waters about 50 million years ago. We catch a glimpse of an adroitly swimming *Zygorhiza kochi*, an early modern whale. Its flippers are the remains of former front limbs, and fin-like appendages are remnants of what once were webbed hind feet.

In geologic terms, Schneider notes, the whale’s transformation has been relatively rapid. But this is not unusual after a major extinction event. When dinosaurs and large marine reptiles died

out at the end of the Cretaceous period, other species filled their niche. Perhaps mesonychids began to exploit the opportunity to feed on fish in the sea and thus began their adaptive evolutionary journey to survival.

In the underwater tunnel, we see *Zygorhiza* chasing a school of pin fish in blue-colored Eocene waters. Sea levels are high, North Carolina’s climate is tropical and the current Coastal Plain is under water, with the coastline reaching well into Johnston County.

Schneider has been gathering and cataloging fossils from coastal sediments for more than two decades. He worked with exhibit fabricators to ensure that the scene reflects the fossil record: a garden ocean bottom complete with a myriad of the Eocene burrowing organisms. Mollusks, snails and a rich variety of bryozoans, sea urchins, sponges, brachiopods, scallops and oysters are found in abundance in the Eocene Castle Hayne Formation.

Now, the sea water changes to a

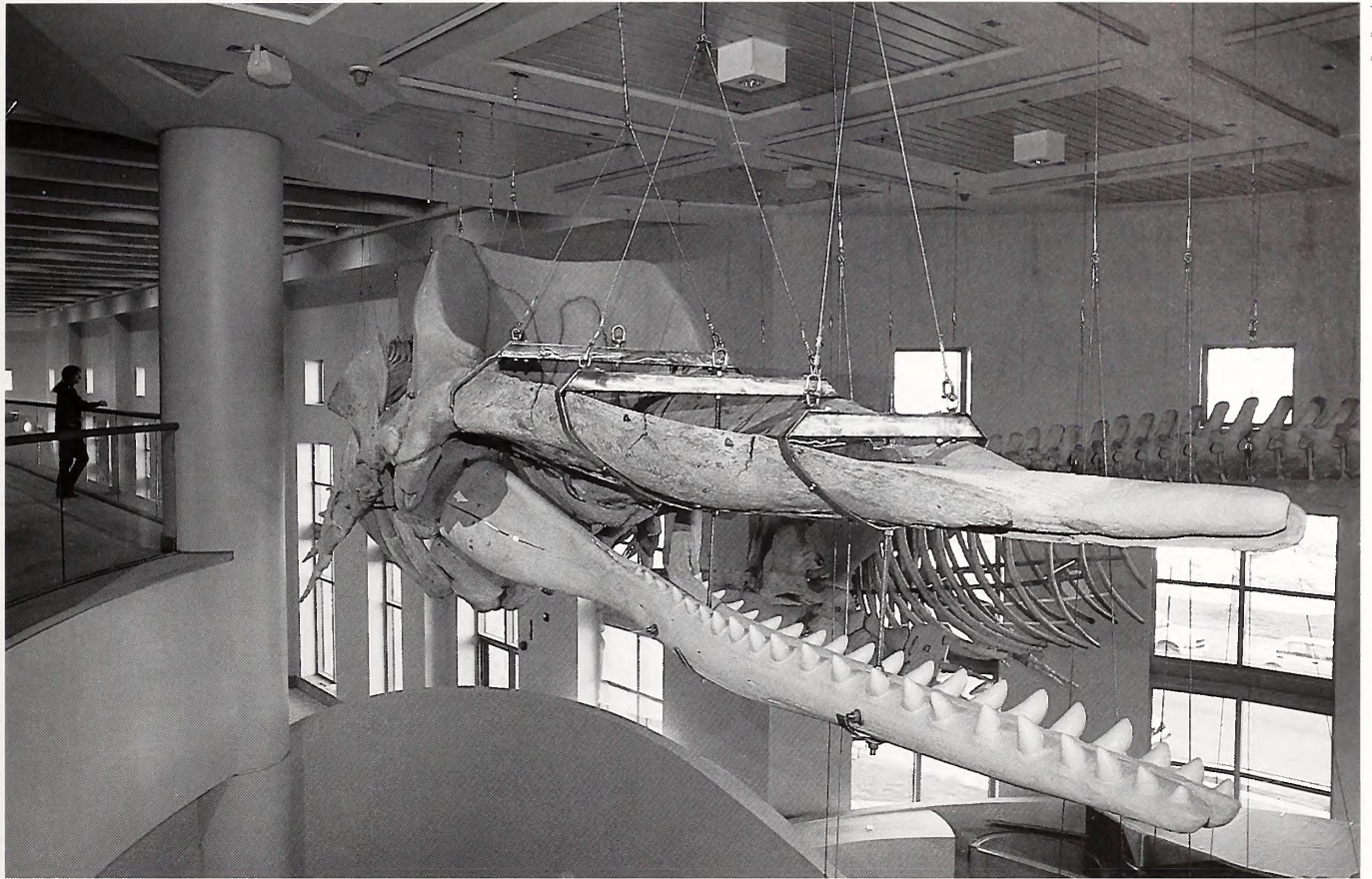
greenish color as we enter the Pliocene epoch, dating back about 4 million years. Fish species are similar to today’s catch: Bonita, tuna, marlin and hake swim the deep waters, while sea robins, puffers and spiny burrfish dart about closer to shore.

We spot *Carcharodon*, a mega-toothed ancestor of the great white shark. The nutrient-rich waters attract large populations of seals, and walrus that navigate the deep sea. Ancient whale bones now begin to litter a sparsely populated hard bottom as their modern descendents appear on the evolutionary horizon. In this geologic time, waves crash along a shoreline roughly defined by I-95.

As we move toward modern times, mastodons and horses roam the savannas during the interglacial Pleistocene epoch, about 2 million years ago. Long leaf pines replace stands of hardwood, and we see a giant ground sloth hunting for food in a somewhat cooler climate.

FIELD WORK IS A COLLABORATIVE
EFFORT FOR DALE RUSSELL, LEFT,
AND VINCE SCHNEIDER.





Peter Dunne

VISITORS TO THE ORIGINAL MUSEUM OF NATURAL SCIENCES WILL REMEMBER TROUBLE, A 55-FOOT SPERM WHALE.

The scene becomes more familiar as we jump ahead on the geologic timeline to the current Holocene epoch. We are on a riverbank of an eastern North Carolina farm in about 1700. A young boy is discovering whale bones eroding from the stream bank. Art reflects life, Schneider says. This whale skeleton fossil dating to the Pliocene epoch was discovered by an amateur fossil hunter in Halifax County in 1993.

We are re-entering contemporary geologic time, and we blink our eyes to adjust to more familiar coastal sights, from saltwater marshes to waves lapping on a sandy shore. And here, as though to remind us of their evolutionary triumph, are the whales!

The museum display is considered a scientific treasure trove. The collection includes a rare right whale and a humpback whale. Trouble, the 55-foot

sperm whale, has been on display for more than a century and has become an integral part of the museum's logo. The newest addition to the museum's coastal exhibit is the skeleton of a blue whale, the largest animal on earth. Fewer than 10 museums worldwide possess a blue whale specimen.

Betsy Bennett, museum director, says, the April opening ushers in a new era for the museum, an agency of the N.C. Department of Environment and Natural Resources. Founded in 1879 to document and interpret the state's natural history, the museum's research collections now total more than a million specimens.

In its new home, major exhibits include Prehistoric North Carolina, Coastal North Carolina, Mountains to the Sea, Tropical Connections and Living Conservatory, North Carolina's Natural

Treasures, and an Arthropod Zoo. The building also features a Discovery Room for families and children, and a Naturalist Center where backyard discoveries can be brought for identification. ☐

The North Carolina Museum of Natural Sciences is located on Bicentennial Plaza, 11 West Jones Street, Raleigh. It is scheduled to open April 7-8, with a 24-hour celebration.

Events include musical performances, interpretive programs, hands-on activities and crafts. The night shift will feature nocturnal creatures, music and a midnight chocoholic buffet.

Regular hours are from 9 a.m. to 5 p.m. Monday through Saturday, and 1 p.m. to 5 p.m. Sunday. Visit the museum on the web at www.naturalsciences.org.

Black Bears

Shy Giants of the Pocosin

By Cynthia

Henderson Vega

Mention coastal wildlife, and you probably think of waterfowl or sea creatures. But at some of North Carolina's coastal wildlife refuges and state and federal parks, there's a chance you'll also see one of the state's largest and most fascinating wild mammals — the American black bear.

Or maybe not. Although black bears are plentiful in the coastal area, they are naturally shy and more likely will spot you first. Distrustful of their only natural predators, black bears tend to hide when humans are around.

Hiding is a remarkable talent for such a massive mammal. North Carolina is known for the size of its bears, says David Rowe, wildlife biologist for the N.C. Wildlife Resources Commission. Males can weigh as much as 600 pounds and adult females between 100 to 300 pounds.



Ken Taylor

Yet in spring and summer barely a day goes by that Wendy Stanton doesn't see bears where she works as a wildlife biologist at the Pocosin Lakes National Wildlife Refuge spanning Tyrrell, Washington and Hyde counties. In fact, Stanton says she sees more of them each year.

To see a black bear in its natural environment is worth the effort, though proper respect should be given to this powerful and often unpredictable animal.

When on all fours, bears show their resemblance to distant wild dog relatives. But bears seem oddly human when they stand and walk upright. They have five toes with long, nonretractable claws on each plantigrade foot, meaning they walk with feet flat on the ground.

While their bulk might suggest that they move clumsily, black bears are actually quite agile and can run up to 30 miles an hour, swim and, unlike the grizzly of the northwestern United States and Canada, can climb trees expertly. Of course tree climbing can be difficult or impossible for the largest members of the species. A 600-pound bruin is unlikely to find itself out on a limb.

The black bear's name can be confusing since they are not always black. They can be brown or honey-colored, and some have white patches on their chests. There is also confusion about their nature. To think of bears as either cuddly, tamable animals or as dangerous threats to humans is equally erroneous.

The truth is that, while bears can be nuisances, they are rarely dangerous. And when a bear is a nuisance, there is often a human cause. That is why Rowe cautions that people should never feed bears.

If they are fed, bears may lose their innate aversion to humans and venture into populated areas. Then property damage is a real possibility. So before offering a bear a Twinkie, better check

your insurance policy for a bear clause.

If a bear searching for food finds itself in the wrong neighborhood and becomes surrounded by a curious crowd, it could feel threatened and become truly dangerous. "We respect these animals," says Rowe.

Unfortunately, such respect does not imply due process for bears. And a bear declared to be dangerous may be destroyed even if the offense was instigated by people.

Humans also help turn bears into nuisances by encroaching on their territory. According to a N.C. Wildlife Resources Commission publication, the black bear's range has been reduced significantly since colonial times.

By the 1970s, the black bear population had deteriorated to the degree that they were deemed a "special concern" at a symposium on endangered and threatened species. That's when approximately 800,000 acres were set aside as bear sanctuaries, and the bear population began to recover. Now around 8,500 black bears live in North Carolina's coastal plain and mountains.

Increased development has brought human and bear habitats closer, with resulting competition. Even without an acquired taste for human food, a bear's appetite can get it into trouble.

Although classified as carnivores, bears are actually omnivores who will eat about anything. Crops such as corn, watermelon, peanuts and wheat often fall victims to hungry bears' appetites. Rowe says it's no myth that bears like honey, and beekeepers in bear country sometimes resort to high-security electrical fencing to protect hives.

Bears aren't picky eaters, either, and a well-stocked garbage container can look like a smorgasbord to them, especially if they have been conditioned to like human food.

When bears are more active — in spring and early summer — Rowe

guesses he gets from two to four calls a week about bears creating a nuisance.

At the Pocosin Lakes refuge, Stanton finds a sense of humor helps to make life among black bears bearable. It's "amusing if somewhat aggravating," she says, when bears chew on signs or use water gauges as back-scratching posts.

Bears feast on corn that refuge employees set out as lures for ducks that are to be banded for study. Stanton recounts seeing seven bears at one time on a 60-square-foot landing bingeing on corn set out to attract ducks. "That's a lot of bears" for that size area, she says.

Despite problems with bears, Stanton is enthusiastic about seeing them. In fact, she considers the Pocosin Lakes refuge to be a "hidden treasure" where a great variety of wildlife can be seen. The best time to see bears is at sunrise and at dusk, she says.

But if you find yourself closer than you would like, don't panic. Above all, don't run, because that may trigger an impulse for them to chase. And they can out-run you. "Stand your ground," Stanton says, and yell or scream.

Rowe agrees, though he says a close encounter "probably won't happen." If an unfriendly encounter does occur, he suggests making noise, and backing slowly away.

Avoid bears in late fall before hibernation because they may be grumpier, Stanton says, although bears in our state are not true hibernators. Instead they take prolonged deep naps.

So, if you go down in the woods today, you could get a big surprise... and if you respect the bear's habitat, it could be a pleasant one.

For more information on Pocosin Lakes National Wildlife Refuge, call 252/797-4431 or visit the Web at: <http://southeast.fws.gov/wildlife/nwrpoc.html>.

Swansboro

Quaint Village is Former Port

By Ann Green

As you cross over the White Oak River bridge into Swansboro, an impressive statue of Captain Otway Burns — the town's most famous ship builder — points you to the historic district.

The picturesque village, which was settled around 1730, was a bustling port during the Revolutionary War. Its major industry was shipbuilding. Burns brought honor to Swansboro by building the *Prometheus*, the state's first steamboat.

The town's port continued to prosper until the end of the Civil War. Ballast stones from sailing vessels still can be found around Swansboro as a reminder of the era.

After the war, as the shipping industry declined, Swansboro became a fishing and lumber community.

Today the seafaring village is a quiet, quaint town. Many of the homes and buildings have been restored.

"Swansboro is a friendly place by the sea," says Jane Brooks, a member of the Swansboro Historical Board and manager of Lighthouse Antiques Inc. "We try not to be commercialized. We try to keep the village as quaint as we can with new growth."

The best way to see this charming town is to take a walking tour. Park your car in the Bicentennial Park where you can view the Burns statue and a memorial to Samuel Swann — the town's namesake and speaker of the N.C. House of Commons during colonial times. Walk directly across the main road (Hwy. 24) to Front Street packed with shops and restaurants. The William Edward

Mattocks House, listed on the National Historic Register, now houses Lighthouse Antiques. Built in 1901, the board and batten-sided house has Colonial Revival features — a steeply pitched roof and a porch engaged to the side of the house. The interior also has distinctive features — ceilings made of plank or head board and heart pine floors. "The house was owned by a lumberman who built boats," says Brooks. He used whatever materials he had. The owner was one of the first men to draw an accurate map of the coastal waters around Swansboro.

The three-story building also has a bottom floor with a keeping room, now used as an apartment.

Walk across the street to the Robert Spence McLean Store. The blue-frame building, built in the 1840s, is now Russell's Old Thyme Shoppe. Ravished by several fires, the store has original heart pine walls with patches of the wallpaper used in 1832.

Two doors down is the Old Brick Store, built in 1839. The building was owned by William Pugh Ferrand, the town's wealthiest merchant and exporter of naval stores. The store is made of hand-made bricks imported directly from England and arranged in the English-bond style. The symmetrical doorway and windows reflect the Federal-style architecture.

Over the years, the building served a variety of purposes — from a prison for Union soldiers to U.S. Post Office. The downstairs, which now houses Golden Traits Jewelry, was once used as a tavern.



Photograph courtesy of Onslow County Tourism

"This store is one of North Carolina's last remaining commercial buildings from the antebellum period," says Brooks.

Turn from Front Street onto Main and get a glimpse of the simple and tranquil lifestyle of some of Swansboro's earlier residents. Many of the homes, including the David James Moore House — owned by a local merchant — are framed two-story homes with front porches.

"This wasn't a rich village," says Brooks. "First Indians settled here and then fishermen and lumbermen."

For the town's people, church life was important. Next door to the Moore House, which now houses the Gray Dolphin Fine Clothing, is the former Swansboro Baptist Church. Go inside and see some of the original features of the church sanctuary, including white columns with gingerbread molding. The



Photograph courtesy of N.C. Archives and History

building is now used for Russell Cinnamon Landing, a gift shop.

Across the street is one of Swansboro's landmarks: the Captain Peter Ringware House. Built around 1778 by Ringware — a privateer in the Revolutionary War — the house has framing made of hand-hewn beams. The foundation was erected from ballast stones.

Turn left onto Elm and view the two-story Jonathan Green Jr. house — the oldest home still standing in Swansboro and likely the oldest in Onslow County. Constructed around 1770, the frame home belonged to the son of the first family to settle on the plantation that eventually became Swansboro.

The house has hand-hewn joists and a foundation built on ballast stones. It also has a number of features associated with Georgian architecture. The right chimney is Flemish bond, and the roof is steep like a Louisiana plantation-style home.

While strolling down Elm Street, stop at the Charles R. Webb House. Built in 1898, the cottage is typical of the period with a tin roof and narrow front porch.

At the end of Elm, turn right onto Broad and walk one block to Walnut

where Swansboro's early settlers are buried in the old cemetery.

While heading down Walnut, turn left onto Church and stroll toward the brick Swansboro Town Hall. Built by the Unitarians, the building was used once as the Emmerton School, which offered excellent instruction in academic and vocational education and claimed the first kindergarten in the county.

The Unitarians' "primary mission in the South was not to make religious converts but to aid their fellow man with education, social work and outright charity," writes Jack Dudley in his new book *Swansboro: A Pictorial Tribute*. "No other church or institution of any kind has had such a profound effect on Swansboro and its people as the Unitarians did."

After seeing the school, head back down Church toward Front Street. Stop and relax at one of the downtown restaurants or walk down to the riverfront and watch shrimp boats come in.

On some days, you can hear ducks quacking and watch seagulls soaring over the water, laughing at you. ☐

Far left:

A statue of Captain Otway Burns in Bicentennial Park greets visitors to Swansboro.

Near Left:

The Old Brick Store is one of Swansboro's landmarks.

Onslow County Museum

Want to view the longest dugout canoe ever found in North Carolina? How about artifacts from a ship sunk during the Civil War or a foot-long oyster shell?

These diverse items are showcased in The Water and The Wood Exhibit at the Onslow County Museum in Richlands.

From fossils of ancient sharks to an enlarged photo of towering live oak trees and purple flowers along the White Oak River, the exhibit depicts the county's prehistory to the present.

"We hope the exhibit helps people develop an understanding that Onslow County's culture is tied to the ocean, beach and pocosins," says Lisa Whitman-Grice, the museum's assistant director.

Stretching over 763 square miles, the county's landscape also includes dense forests. One display highlights the importance of naval stores during the antebellum period. Another focuses on a framed 18th century house.

Museum hours are Tuesday-Friday 10 a.m. to 4:30 p.m. and Saturday and Sunday 1 to 4 p.m. For more information, call 910/324-5008. ☐



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KEEP OFF
THE DUNES

BEACH NOURISHMENT DEBATE

The Summer Scene

Ah! Sunny days delight us as spring turns into summer. We are all ready for a beach trip.

At a recent workshop, Sea Grant colleague Barbara Doll talked about growing up in Currituck County when beach houses were truly cottages down sandy roads and driveways.

Today's "cottages" may come with five bedrooms and an in-ground pool, not to mention the paved street, driveway and shopping plaza nearby.

Such is the story of change along much of our coast.

And while coastal communities were not singled out, they are prime examples of topics considered during the 2000 Emerging Issues Forum held at North Carolina State University earlier this year.

For example, the "smart growth" catch phrase usually refers to limits to suburban expansion in the rings outside urban areas. But some coastal counties — including Dare, New Hanover, Carteret and even Brunswick — also have seen rapid growth in recent years. New businesses hope to build on the tourist trade and the arrival of retirees.

And not everyone has to wait until retirement. With cell phones, e-mail and Internet connections, a variety of business consultants find themselves drawn to the shore year-round, where they can work on a laptop on the deck or take a conference call while walking on the beach.

But such prosperity is not universal. Other coastal counties have seen their populations drop. Without a business base, they lose young adults to jobs inland or in the tourist-concentrated areas. Often fishing families, in places such as Hyde County, make a living by mixing land-based jobs with crabbing, shrimping or fishing.

Thus, coastal residents may have differing views of another catch phrase: sustainability.

Where growth is rampant, the coastal environment may be at risk as drainage patterns are changed and nutrients run off from fertilized turf or through paved parking lots.

Where development has been limited, opportunities may also be limited. Residents may be looking to draw business and tourist dollars



Herman Lankford

without challenging the environment or their existing communities.

North Carolina Sea Grant extension staff seek to preserve the sustainability of both the environment and the coastal communities. For example, several hundred people recently attended coastal development workshops that focused on water quality issues. At the same time, Sea Grant staffers are working with a coastal paddling initiative that would first assess and then promote paddling as a nature-based tourism option.

Such extension projects are the heart of the Sea Grant program. In addition to developing long-term topics, Sea Grant specialists offer rapid response to immediate needs, such as coping with the effects of the 1999 hurricanes. For example:

Water quality specialist Barbara Doll is working with Sea Grant researchers and state agencies to develop a fact sheet to explain testing done on waters used for recreational activities, from swimming to canoeing or riding personal watercraft.

Marine education specialist Lundie Spence will lead a workshop for teachers June 26-29 to consider the cause and effects of the flooding that accompanied Hurricane Floyd. The teachers will take the lessons back to their classrooms.

Coastal construction and erosion specialist Spencer Rogers conducted an inventory of buildings damaged by hurricanes Dennis and Floyd.

Coastal law and policy specialist Walter Clark prepared information explaining rebuilding options or limitations in oceanfront areas that sustained major damage. See *Legal Tides*, page 22.

Want to know more about effects of the 1999 hurricanes? Check out *Sea Science* on page 24 to learn about Sea Grant-funded water quality research as well as the economic impact of the floods.

Also, turn to page 3 for a Coastal Tidings item on a conference at East Carolina University in late May that will consider the effects of Hurricane Floyd and options to limit damages in future catastrophes. The conference will feature reports by several Sea Grant researchers.

Katie Mosher, Managing Editor

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Coastwatch

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SEAFOOD SAFETY

N.C. Products Get Clean Bill of Health

From docks to processing tables to restaurant kitchens, safety is a constant factor with seafood processors. Ann Green takes readers on a state inspection of a North Carolina crab company. 6

RHYTHMS OF THE SEA

Griffith Chronicles Coastal Change

In his new book, David Griffith reports results of coastal studies and weaves stories of very different people who are linked by ties to the coastal waters. Katie Mosher gives a preview of the book and a glimpse inside Griffith's laid-back approach to field work. 10

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Nature's Work-in-Progress

Beach nourishment is a "hot button" topic, that evokes as many opinions as grains of sand on the beach. Pam Smith gives an overview of the science and public debate. 16

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The 1999 hurricanes left many homeowners stranded. Legal specialist Walter Clark looks at the challenges of rebuilding. 22

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Floyd Follow-up: The Lingering Effects

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Maritime Forests: Where Beauty and Science Converge

Protecting the ecological functions of North Carolina's maritime forests is a collaborative effort. Pam Smith takes you on a tour of these coastal wonders. 27

Coastwatch

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The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 12-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

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*Front cover photo of beach house
by Spencer M. Rogers.
Table of contents photo of
sand dune by Scott D. Taylor.*

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COASTAL TIDINGS

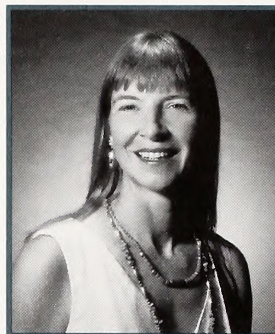
Spence Named Environmental Hero

North Carolina Sea Grant marine education specialist Lundie Spence has earned national honors for her leadership in the state's environmental education movement.

Spence has been named a NOAA Environmental Hero for 2000. Initiated in 1996, the program recognizes heroes for their "tireless efforts to preserve and protect the nation's environment."

In her 22 years with Sea Grant, Spence has led numerous efforts to protect North Carolina's environment.

In 1987, she initiated the first Big Sweep in North Carolina. That year saw 1,000 volunteers gather 14 tons of trash on North Carolina's beaches. The program grew statewide. By 1995 each of the state's 100 counties had designated a Big Sweep coordinator. The program continues today as a nonprofit organization.



Spence, who teaches coastal issues and ocean frontier courses at North Carolina State University, also has been influential on the college level. In 1997, she initiated the first environmental education course taught on undergraduate and graduate levels in The University of North Carolina system.

Through interactive video technology, the course reaches four UNC campuses.

In 1997 and 1999, Spence coordinated COAST/Operation Pathfinder, a graduate professional development course for teachers in the mid-Atlantic region. More than 50 teachers have taken the engaging lessons back to their classrooms.

Recently, Spence has been a driving force in the development of a North Carolina coastal plain river and estuarine paddle trail network that promotes ecotourism and environmental awareness.

— A.G.

Hodson Receives Sea Grant Award

North Carolina Sea Grant Director Ron Hodson has received honors from his fellow Sea Grant directors.

"The Sea Grant Association President's Award was given to Dr. Ron Hodson for his outstanding skill and dedication as a Sea Grant director," says Russell Moll, director of Michigan Sea Grant and association president.

The award was presented during the

group's meeting in Washington, D.C., in March. There are 29 Sea Grant programs across the country, representing coastal and Great Lakes states.

Hodson was named director of North Carolina Sea Grant in July 1998, after 18 months as interim director. He previously was associate director for research for the North Carolina program.

— K.M.

In the Next Issue of *Coastwatch*

Accessible only by boat, Ocracoke Island has a sense of mystery for many folks from the mainland. Join teachers from around the state as they delve into the unique history and environmental wonders of this fishing village. And welcome a return visit from David Cecelski and his Historian's Coast column — a preview to the release of a new collection of his *Coastwatch* essays in book form.

ECU Conference Looks at Impacts of Hurricanes

East Carolina University will host "In the Aftermath of Floyd: Recovery in the Coastal Plain," May 24-26, at the Mendenhall Student Center.

The conference will bring together citizens whose lives were disrupted, scientists, students, policy makers and agency representatives.

The goal is to better prepare Eastern North Carolina citizens and officials to deal with future extreme weather events to lessen the loss of lives and property.

Gov. Jim Hunt will deliver the keynote speech at 7:30 p.m. Wednesday, May 24. In addition, Robert Sheets, former director of the National Hurricane Center, will speak at 7:30 p.m. Thursday, May 25. *Both evening presentations are free and open to the public.*

The conference workshops open at 8:30 a.m. Wednesday. Researchers will report on projects that relate to the effects of the 1999 hurricanes and floods.

Workshop topics include extended recovery response; short- and long-term floodplain management; risks and benefits; sustainable recovery and mitigation; and areas of responsibility.

All sessions will include audience response. The final forum on Friday, May 26, "Lessons Learned and Recommendations," will review preliminary results from the break-out sessions.

Participants will be encouraged to develop strategies to rebuild "smart" in a region that is rapidly growing, but also is increasingly vulnerable to severe weather disasters.

Registration fee, \$65 for the general public and \$35 for students, covers conference materials, lunch on Wednesday and Thursday and dinner on Thursday.

For information call Pam Cloer, events coordinator, 919/515-7990; or visit the Web: www.ecu.edu/coas/floyd/.

For information on post-hurricane research, turn to Sea Science on page 24.

— P.S.



Spencer M. Rogers

Hurricane Expo Set for June 3

North Carolina Sea Grant will take part in Project Impact: Hurricane Preparedness Expo 2000 from 9 a.m. to 7 p.m. June 3 at Trask Coliseum at the University of North Carolina at Wilmington.

Project Impact is a Federal Emergency Management Agency (FEMA) initiative that helps communities protect themselves from the devastating effects of natural disasters by taking actions to reduce disruption and loss.

Exhibits will include products and demonstrations aimed at making area residents "disaster resistant" and better prepared for the next storm.

FEMA named New Hanover County and the municipalities of Carolina Beach, Kure Beach, Wilmington and Wrightsville Beach "Disaster-Resistant Communities" in 1997.

Last year, the local expo raised nearly \$17,000 for the American Red Cross, Salvation Army and Cape Fear Area United Way. Attendance reached 6,000 — the largest of its kind in the U.S.

Spencer Rogers, North Carolina Sea Grant coastal erosion and construction specialist, will present several workshops, as will Sea Grant researchers from Clemson University.

For information, call Debbie Reed at 910/341-4595.

— P.S.

Neuse River Day 2000

Neuse River Day 2000 will get under way at 8:30 a.m. Saturday, June 3, at New Bern's Union Point Park, as dozens of paddlers cast off for a 12-mile canoe and kayak challenge. A cash prize awaits the winner.

Recreational paddlers may find the 5-mile event and its "paddle plaque" award just as enticing. A raft race at 11 a.m. offers another creative, competitive alternative.

The annual festival is sponsored by the Neuse River Foundation, says volunteer Bill Cote, "to give people a chance to celebrate this wonderful water resource in our back yards."

The festival's educational exhibits

will raise public awareness of the efforts to help improve water quality, Cote adds.

North Carolina Sea Grant will join dozens of other exhibitors on the banks of the Trent and Neuse rivers for daylong activities — face painting, a petting zoo, fire safety demonstrations, and arts and crafts.

The Neuse River Foundation aims to preserve and improve the water quality of the Neuse River. The Neuse flows more than 200 miles through 19 counties within its 6,192 square-mile basin — home to one-sixth of the state's population.

For more information, or to register for events, call the foundation at 252/637-7972.

— P.S.

COASTAL TIDINGS

N.C. Ocean Bowl Winners

For the third time in three years, Walter Williams High School in Burlington won the N.C. Ocean Science Bowl in March at North Carolina State University. An alternate Williams team was runner-up.

Southside High School in Chocowinity took third place honors.

Fourteen teams competed in the third annual regional event at the McKimmon Center in Raleigh.

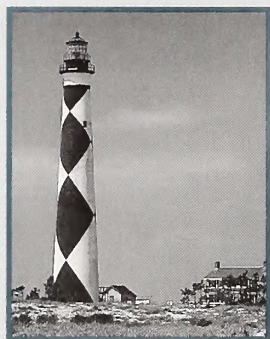
The Ocean Science Bowl was inaugurated in 1998, The Year of the Ocean, as a way to re-energize precollege educational programs in the marine sciences.

The 2000 state championship team received scholarships from NC State's

College of Physical and Mathematical Sciences. They also advanced to the National Ocean Science Bowl Tournament in Washington, D.C., in April. All three top teams won a saltwater canoe trip donated by the N.C. Coastal Federation.

The N.C. Ocean Science Bowl is coordinated by the Consortium for Oceanographic Research and Education (CORE), which includes NC State, East Carolina University, the University of North Carolina at Wilmington and the University of North Carolina at Chapel Hill. Support also comes from North Carolina Sea Grant, the UNC Math and Science Education Network and Centers, the N.C. Coastal Federation and NC State's Science House.

— A.G.



Scott D. Taylor

Life at the Edge of the Sea

The Southern Coastal Heritage Program will host its annual "Life at the Edge of the Sea" teacher workshop June 20-23 at Trinity Conference Center in Salter Path.

The workshop covers diverse fields — geology, archeology and anthropology, marine sciences and folklore.

This year's "adventure sites" include Cape Lookout Lighthouse and National Seashore and the Waterfowl Museum on Harkers Island. Teams will create a virtual field trip to use in their classrooms.

The \$395 registration fee covers room and board, marine transportation, and a 500-page resource book. Participants earn three continuing education units.

The program is sponsored by North Carolina State University in cooperation with East Carolina University and the University of North Carolina at Wilmington. Instructors also include local experts. Check last year's workshop at www2.ncsu.edu/ncsu/chass/extension/coastal.html.

Registration is limited. Contact Chip Futrell, NC State Continuing and Professional Education, 919/513-1938.

— P.S.

Seafood Directory Updated

A good catch isn't always a load of fish. Sometimes it's a good idea that catches on — like the North Carolina Seafood Directory.

Originally published through support from a 1998 Fishery Resource Grant (FRG), the directory was a good idea caught by the N.C. Department of Agriculture and Consumer Services, which expects to have an updated directory available soon.

The directory reads like a census of seafood offered by North Carolina distributors from the coast to mountain streams. Readers can find flounder or sea spot. There are catfish and dogfish. Even porgy and bass.

The colorful listings include bluefish, red snappers, croakers and grunts. And that's just a sampling of the finfish.

The shellfish listing is equally extensive, with oysters, shrimp, clams, mussels, conchs and crabs — hard or soft shell, snow or stone. Also included are prepared delicacies, such as crab cakes or smoked tuna, as well as live

seafood. Other products include bait fish, fish meal and seafood compost.

William Small II, seafood marketing specialist for the agriculture department, says the directory is a valuable marketing tool. In fact, it has proven quite popular at the annual Boston Seafood Show, which is, according to Small, "the seafood show of the year in the world."

A Sea Grant seafood availability chart is included with the directory.

Free listings are available to licensed seafood dealers, aquaculture producers and seafood distributors. For the original project, Clifton Lynch of the agricultural marketing division surveyed more than 1,000 businesses.

For more information on the directory, contact Small at 252/331-4773.

To learn more about the FRG program, call 919/515-2454 or 252/247-4007. Or check the Web at www.ncsu.edu/seagrant and follow the research links to the FRG pages. The next deadline for proposals is June 1.

— C.H.V.

Thigpen Acting Extension Director

North Carolina Sea Grant has a new acting extension director steering the course for the field staff.

Jack Thigpen, North Carolina Sea Grant's coastal recreation and tourism specialist, took on the new duties in March. Since fall 1998, the extension program had been headed by Steve Olson, who served as associate director for outreach. Olson is now director of governmental affairs for the American Zoo and Aquarium Association in Washington, D.C.

Thigpen has extensive outreach ex-

perience. Since coming to North Carolina Sea Grant in 1998, he has focused on sustainable coastal development and the human dimensions of fishing and wildlife.

Thigpen previously was associate professor of rural sociology and extension community development specialist at Texas A & M University. In his new position, he will coordinate Sea Grant's extension and educational programs. He also will continue to serve as the coastal recreation and tourism specialist. — A.G.

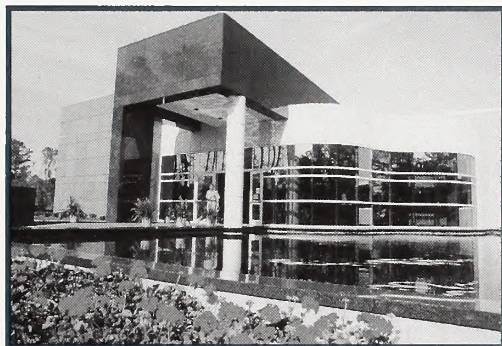
UNC-W Opens Center for Marine Science

The long-awaited, 75,000-square-foot Center for Marine Science at the University North Carolina at Wilmington boasts 52 research labs, a greenhouse and aquarium facilities, not to mention a 900-foot dock on the Intra-Coastal Waterway.

The new center across from Masonboro Island is a far cry from the maze of trailers and huts that housed campus marine research programs for many years.

In addition to long-standing programs such as marine biology and coastal geology, the center is expanding into new programs, such as a master's degree program in oceans and human health, a multidisciplinary approach to coastal ocean monitoring, and participation in the Joint Institute for Caribbean Marine Studies.

Dedicated in March, the facility also provides offices for cooperative programs, including North Carolina Sea Grant, the National Undersea Research Program, and the North Carolina Coastal Reserve Program. UNC-W faculty also lead the



Lower Cape Fear River Program, which offers research and public education on water quality issues in the river and estuary.

A number of research projects at the center have been funded by North Carolina Sea Grant, including studies of inlet migration, juvenile blue crabs, effects of nutrient levels on benthic organisms, and heavy metals in Cape Fear River sediments.

"The results of Sea Grant research at UNC-W have provided sound science answers to a number of tough questions North Carolina faces," says Sea Grant Director Ron Hodson.

"We are proud to be affiliated with the marine science program as it continues to grow both in range of study and in stature," Hodson adds.

The Sea Grant office, located on the first floor of the center, includes offices for Spencer Rogers, coastal construction and erosion specialist, and fisheries specialist Jim Bahen.

To learn more about the UNC-W center and programs, check the Web at www.uncwil.edu and follow the links. — K.M.

Summer Learning Can Be Fun

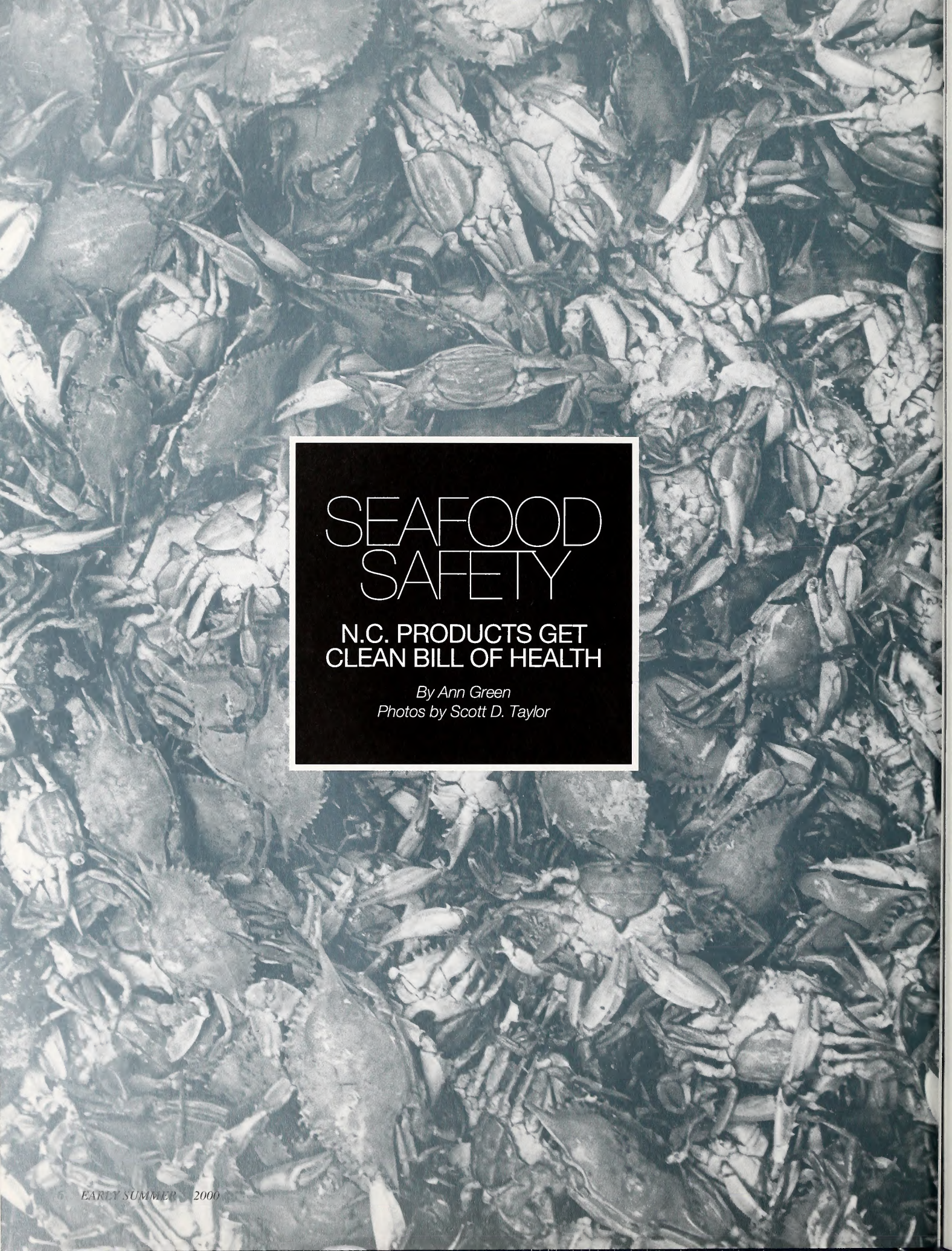
As summer approaches, most students may be eager to close their traditional textbooks — but the learning continues with a variety of special classes and workshops along the North Carolina coast.

For example, the North Carolina Maritime Museum in Beaufort will offer a maritime archeology summer field school July 17-21. The program will offer a hands-on introduction to coastal and underwater archaeology in North Carolina — and techniques used in the discovery and documentation of shipwrecks and historic underwater sites. Cost is \$100 for the week. For more information on the museum's summer programs, call 252/728-7317.

Other coastal programs abound, including Marine Quest at the University of North Carolina at Wilmington. For information, contact Diane Talley at 910/962-3798, talleyd@uncwil.edu.

If you are looking for day-programs for the entire family, check the North Carolina Aquariums' calendars.

Links to the aquarium Web pages and other coastal education programs can be found on the North Carolina Sea Grant marine education pages. Go to www.ncsu.edu/seagrant and follow the extension links to marine education. — K.M.



SEAFOOD SAFETY

**N.C. PRODUCTS GET
CLEAN BILL OF HEALTH**

*By Ann Green
Photos by Scott D. Taylor*

Before

Wayne Mobley begins a state inspection of an eastern North Carolina crab company, he washes his hands in the picking room.

Then Mobley glances around at elderly women sitting around stainless steel tables, knives in hands, swiftly picking meat out of steamed blue crabs. Signs are posted in English and Spanish because many foreign workers will arrive on special visas later in the year.

"Those workers have a language barrier," says Mobley, regional environmental health specialist, N.C. Division of Environmental Health, Shellfish Sanitation Section. "Some plants have to teach workers how to sanitize properly and the proper way to use processing equipment."

While Mobley looks around at the workers' aprons to make sure they are clean, the women continue picking crabs. Workers must pick the meat at a rapid pace.

"The state law requires that the plants have three-and-a-half hours from the time the crabs are placed on the table as whole cooked crabs until the product is cooled down in cups to 40 degrees," Mobley says of the cooker-to-cooler cycle.

Since crabmeat temperature is critical, he places a thermometer in a cup of just-picked crabmeat. "The meat is 62 degrees," he says. "The crabmeat temperature usually stays in the low 60s. During the summer, the temperature may elevate slightly."

Mobley then rubs his hand under a table and finds traces of crabmeat. "This table needs scrubbing underneath," he says to a supervisor. "If a table is too dirty, I make the manager take the crabs off the table and resanitize it."

His inspection is thorough and precise. He even looks on the floor to make sure no claws or crabs have fallen. And he checks the machinery, from canning to pasteurization — a cooking process that extends the shelf life of crabmeat.

Throughout the plant, Mobley only finds a few minor violations, including stray cats eating scraps out of trash cans near the loading dock and a hose on the picking room's floor.

"The crab industry is a big business and operates as such," says Mobley. "We tell them what is required, and the owners do what is asked."

The state inspection — which is required quarterly for all crab and molluscan plants and monthly while crab plants are operating — is just one aspect of seafood safety in North Carolina. From dock to processing tables to restaurant kitchens, safety is a constant factor.

All plants that process molluscan shellfish, including clams, oysters and mussels, and all crustacean plants must follow the U.S. Food and Drug Administration's (FDA) safety program known as Hazard Analysis and Critical Control Point (HACCP).

Initiated in 1997, HACCP is required for all seafood dealers, processors and importers and aims to minimize hazards in seafood — such as histamine poisoning in certain fish such as tuna — before the seafood reaches the consumers.

The N.C. Department of Agriculture has an agreement with the FDA to do HACCP inspections of some of the state's seafood facilities, other than the shellfish dealers. The department also monitors the facilities' manufacturing and housekeeping standards.

Are the state and federal regulations protecting consumers from unsafe seafood?

"Fish and seafood from North Carolina waters are very safe to eat," according to Barry Nash, North Carolina Sea Grant seafood technology and marketing specialist.

There is no documented evidence of illness caused by North Carolina-produced shellfish and shellfish products, according to the Shellfish Sanitation Section in Morehead City.

However, there have been a few reported cases of a food-borne illness related to prepared fish, says Joe Reardon, food compliance supervisor for the N.C. Department of Agriculture. In January 1999, Reardon says two people were reported ill from histamine poisoning after eating tuna salad at a Wilmington restaurant.

For healthy individuals, the nutritional benefits of seafood, such as Omega-3 fatty acids — which have been shown to prevent heart disease — far outweigh safety concerns. The risk of becoming sick from eating seafood is one in 250,000 compared to one in 25,000 from eating poultry, according to the FDA's Center for Food Safety Study in 1991.

Continued



"Consumers equate product quality with food safety," says Nash, whose office is at the North Carolina State University Seafood Laboratory in Morehead City. "Many people assume that seafood is not as safe as beef and poultry products. Seafood that is properly cooked is as safe as any cooked beef or poultry product."

Mobley says state regulations protect the consumer as well as the industry. In addition, he says the section helps the seafood industry put out a good product.

While making routine inspections and yearly recertification checks, environmental health specialists encourage plants to upgrade their processing facilities and equipment.

"In the last 10 years, the number of crab plants has decreased, but crab processing still leads the way in the seafood industry," says Mobley.

Several North Carolina crab plants have installed sleek, modern equipment. At CryoTech Food Systems in Aurora, every live crab travels through a tunnel where it is cooked and frozen. The company also uses nitrogen freezing.

Carolina Seafood Inc. in Aurora has remodeled its facility to include fiberglass walls that are easy to clean and air conditioning in the culling rooms where crabs are separated. "We cool crabs as soon as they come off the boat," says owner Etles Henries. "That way we have no spoilage."

HACCP STANDARDS

In addition to state regulations, crab plants and other seafood processors must follow HACCP's stringent safety standards. Under the plan, companies first scrutinize their operations for "hazards that are reasonably likely to occur and would cause illness or injury to the consumer."

These include biological hazards such as bacteria and viruses. At Washington Crab Company in Washington, owner Jimmy Johnson says they pay particular attention to the pasteurization process.

"If you don't get the crabmeat pasteurized properly, you don't kill the bacteria," says Johnson, chairman of the N.C. Marine Fisheries Commission.

Plants also must watch for chemical hazards such as histamine, which is produced naturally by bacteria on certain fish and can cause severe allergic reactions in some people. Physical hazards include metal fragments.



A worker shovels scraps of crabs at an eastern North Carolina plant.

Businesses must then find ways to manage hazards through "critical control points." To keep bacteria from producing histamine in fish, for example, seafood is stored on ice at or below 40 degrees.

Under the rules, crab processors must record the time and temperature at which each batch of crabs is cooked and monitor their coolers at least twice daily.

To help seafood companies with their cooking operations, the NC State Seafood Lab has conducted validation tests at 15 facilities.

"We conduct temperature distribution profiles to determine if the cooking schedule is adequate to eliminate harmful bacteria," says Dave Green, director of the lab and a North Carolina Sea Grant researcher. "We found all plants met the minimum requirements, but in many cases, greater efficiency could be achieved with simple changes in procedures."

Under HACCP, companies must write and follow basic sanitation standards, including using safe water in food preparation and cleanliness of food surface contacts.

How is the new program working?

"We are satisfied that people are complying with HACCP," says Reardon. "The most common violation is record keeping. Most of the problems are around the maintenance of records."

Dealers and processors often complain about the extra paperwork. Although Henries of Carolina Seafood supports the basic principles of HACCP, he says the "paperwork is a nightmare."

Johnson agrees and says the program has added another layer to the bureaucracy. "HACCP doesn't address where the problems have historically occurred — during transportation or at home after the product is purchased."

Because of the HACCP plan, Johnson hired two additional workers. "However, there has been no increase in the price that we get for the crabmeat," he says.

SEAFOOD SAFETY WORKSHOPS

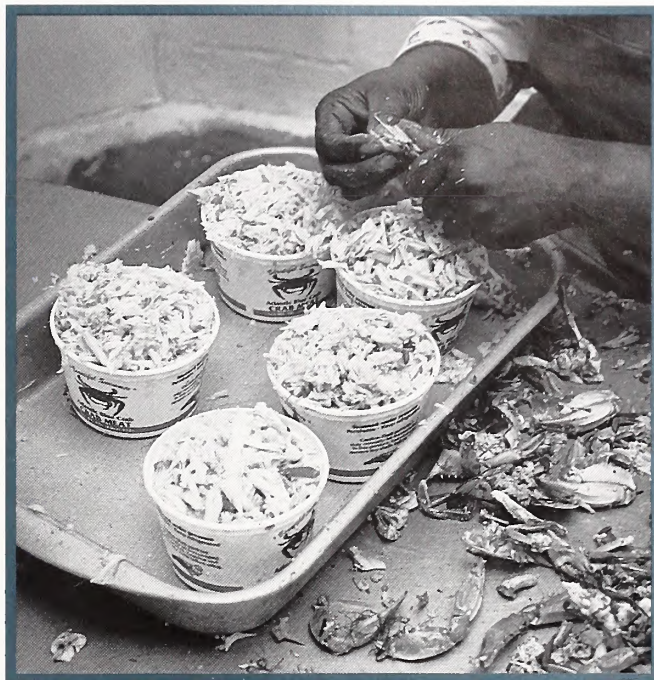
Since the seafood safety program came into effect, North Carolina Sea Grant and the N.C. Cooperative Extension Service have offered HACCP training workshops. The FDA requires HACCP certification for seafood dealers and processors when designing a HACCP plan and reviewing records.

"We have trained about 400 workers at 12 workshops," says Nash.

This summer, North Carolina Sea Grant and the Extension Service will be offering new sanitation control workshops. At the one-day workshop, industry workers will draft sanitation standard operating procedures and develop monitoring programs for FDA's key sanitary conditions, including rodent



In the picking room, Wayne Mobley checks the temperature of crabmeat.



Experienced hands quickly pick crabmeat from stubborn shells.

control and clean water.

After seafood is processed, it is handled by a number of people, including restaurant workers.

To educate restaurant workers about seafood safety, North Carolina extension agents Jean Rawls and Sandra Maddox initiated a restaurant safety course. With funding from a N.C. Fishery Resource Grant, the agents developed a video, handbook and workshop for restaurant workers.

The course, which covers all types of seafood and every stage of handling — from inspection upon arrival to serving — arose from the increasing concern about the potential for a public health problem in the growing coastal area. "We have a lot of seafood restaurants in our area," Rawls says.

Restaurants, which are inspected by county health departments, typically employ many young people, perhaps newly graduated from high school, with minimal background in food service and little knowledge of the biological threats to food safety.

"This is for people who don't have that technical experience," she adds.

Between HACCP and food safety training for restaurant workers, Nash says that consumers should not have any concerns about eating seafood.

"North Carolina processors have a long history of providing safe seafood to their customers," he says. "HACCP and the restaurant food safety training initiatives will ensure that North Carolina remains a source of wholesome seafood and seafood products for both wholesale and retail buyers." ▣

Rhythms of the Sea

GRIFFITH CHRONICLES COASTAL CHANGE

By Katie Mosher

As an anthropologist, David Griffith documents change in North Carolina's coastal communities as they meet this new century head on. As a poet, Griffith looks beyond the statistics to the rhythm and cadence of lives in the midst of change. He sees patterns in the ecosystems and songs in the stories of days gone by.

During the course of his studies and fieldwork, Griffith has been mistaken for a CIA agent in Latin America and a "revenue man" on fishing boats in North Carolina. Often his laid-back approach and basic questions convince subjects that he couldn't really be a college professor.

"I am not a very threatening person — and I am genuinely interested in their stories," says Griffith, a North Carolina Sea Grant researcher from East Carolina University. "I love spending time with people who are different than I am."

Those differences are quickly set aside when coastal residents realize he is there to listen, not lecture, says Susan West of Buxton. "David is very good at listening — and hearing what people have to say," says West, who has a family perspective on commercial fishing.

In his new book, *The Estuary's Gift: An Atlantic Coast Cultural Biography*, Griffith not only reports results of his

formal studies, he also weaves the stories of very different people who are linked by their ties to the coastal waters.

His essays tell of slaves who escaped through hidden canals and whaling families who lived in Diamond City. More modern stories include those of Mexican women picking blue crab, commercial fishers frustrated by regulations, and recreational anglers competing in high-dollar tournaments.

Griffith's study of changes in coastal communities goes hand-in-hand with the biological and chemical studies of coastal ecosystems, says Ronald Hodson, North Carolina Sea Grant director.

"We need to understand not just the biology, but also the human involvement," Hodson says. "We can't do any management scheme without knowing the human relations and interactions."

Bill Queen, director of ECU's Institute for Coastal and Marine Resources, agrees.

C o n t i n u e d





Cliff Hollis, East Carolina University

"Because fishers move from one territory to another to fish, shift from crab pots to shrimp trawls or from gill nets to clam rakes, because they land croaker during one season and

mullet or blue crabs during another, they are the group of people best situated to monitor the health of coastal rivers, sounds, ocean waters and estuaries."

— "THE ESTUARY'S GIFT"

*Oystering, Washington, NC, c. 1884.
Courtesy of the NC Division of Archives and History*



He points to the dramatic change that has come to the Outer Banks in the past 10 years. "From Nags Head to Corolla — now it looks like a suburb of Los Angeles," he says.

While marine scientists are evaluating the environmental impact of such change, attention also must be focused on societal forces that drive the change. Griffith, working with ECU sociologist Jeff Johnson, has given North Carolina a reputation of being on the cutting edge of social science research on coastal topics, Queen says. "Programs in other states use this as a model," he adds.

And, their research results have provided critical input for state advisory panels, legislators and regulators. "It paints a true picture of what is taking place," says Twila Nelson, who met Griffith when she served on the N.C. Marine Fisheries Commission.

West, who served on the Fisheries

Moratorium Steering Committee in the mid-1990s, agrees. "I've been impressed with the perspective he's brought to discussion of fisheries issues," she says. "You're not just talking about managing fish, you are talking about managing people and communities."

Coastal Studies

Griffith, now 48, arrived in North Carolina in 1983 to work on a research project on underutilized fish species. Jim Murray, then extension director for North Carolina Sea Grant, and Johnson led the work, which was funded by the National Marine Fisheries Service.

Griffith prepared a detailed format and sequence for interviews of fishers along the coast. He also conducted the interviews along the docks and sent

regular reports from the field. But the reports showed a certain style from Griffith, who had attended the prestigious Iowa Writers' Workshop.

"I used to love reading his field notes," recalls Murray, now director of extension programs for the National Sea Grant College Program. "He would send us these elaborate, flowery field notes. He would muse about the sunrise... He must have had a great time going back to the motel room to write them up."

While Griffith's poetry background sparks his academic prose, the anthropology field experiences also provide fuel for his creative writing, Murray explains. "He has been able to marry the two disciplines. Each helps the other," he says.

That first project gave Griffith an introduction to North Carolina issues, and introduced him to the Sea Grant program. It also sparked continuing collaboration with Johnson. Such collaboration lends integrity to the projects, Griffith says.

"They routinely spot and report incidents of pollution. They experience the waters, often taking note of changes that are too subtle and require too many observations for anyone but fishers to notice. They tickle the bottom with crab pots, assess the condition of sea grasses snarled in their nets, witness in the debris of their catch the litter of tourists and the natural trends of biological diversity."

— "THE ESTUARY'S GIFT"

*Men checking a pound net, Colerain, NC, c. 1939.
Courtesy of the NC Division of Archives and History*



And it splits the workload. "My strengths are analytical. His strengths are in writing. We work together," Johnson says. In fact, an ECU publication profiled the pair as a "dynamic duo," with Johnson as the outspoken numbers cruncher and Griffith as the quieter wordsmith.

Since their first project together, all of their collaborative efforts have included an outreach or extension component. "We are trying to change something for the better," Johnson says.

Murray recalls Griffith going out of his way to participate in public forums or to make public presentations of findings. "David very much understands the value of extension," he adds.

Johnson and Griffith continue to collaborate – including a new two-year Sea Grant project that will document the technical environmental knowledge held by commercial fishers and others in the seafood industries. "They monitor the resource for us," explains Griffith,

repeating a theme that runs throughout *The Estuary's Gift*:

"Because fishers move from one territory to another to fish, shift from crab pots to shrimp trawls or from gill nets to clam rakes, because they land croaker during one season and mullet or blue crabs during another, they are the group of people best situated to monitor the health of coastal rivers, sounds, ocean waters and estuaries. They routinely spot and report incidents of pollution. They experience the waters, often taking note of changes that are too subtle and require too many observations for anyone but fishers to notice. They tickle the bottom with crab pots, assess the condition of sea grasses snarled in their nets, witness in the debris of their catch the litter of tourists and the natural trends of biological diversity."

For example, Griffith tells the story of a scallop fisher he calls Davis Evans, who hails from the Bogue Banks in

Carteret County. Evans and his father-in-law bring in the catch one day, then spend the next day shucking alongside family and neighbors. It is Evans who takes Griffith out for a day of scalloping and jokes to other fishers that he has a revenue man aboard.

"Each time Davis pulled the net into his skiff, he examined its contents. More than once he showed me small organisms that resembled insect larvae and commented that they were more or less plentiful than they had been in past seasons. To me, they all looked the same," Griffith writes.

And the fishers themselves feel a part of the ecosystem, as one Stumpy Point fisher explains. "I'm 63 years old. I can't hardly remember when I wasn't fishing. I'm as much a part of this sound as the things that live in it."

Griffith writes of the close ties between coastal communities and the sea

C o n t i n u e d

Griffith writes of the close ties between coastal communities and the sea — from precolonial

Algonquins to the thriving herring fisheries in the early 1900s. Now young adults are less

likely to have such a strong connection to the

full-time fishing. And even middle-aged and

older fishers take land jobs to make ends meet

— often losing the independence of fishing and

their intimate links to the water.



Oyster planting, Broad Creek, NC, c. 1935.

*Courtesy of the NC Division of Archives
and History*

— from precolonial Algonquins to the thriving herring fisheries in the early 1900s. Now young adults are less likely to have such a strong connection to full-time fishing. And even middle-aged and older fishers take land jobs to make ends meet — often losing the independence of fishing and their intimate links to the water.

“Full-time fishers see it happening all the time. They notice that fishers who leave fishing for a full-time job ashore, phasing back to part-time fishing, slowly lose the ability and perhaps the motivation to continue monitoring and protecting the resource,” Griffith writes.

Picking Out Patterns

Griffith’s studies of the seafood processing industry began with a Sea Grant project in 1985. He watched as scallop houses remained family-oriented

operations, while crab processors began hiring Mexican women on special visas. “I am still studying seafood processing. There has been fascinating change,” he says.

In fact, in his book, the chapter on “Vanishing Women” is one of his favorites. “Why vanishing? Because, historically, North Carolina’s crab pickers slipped into the recesses of coastal counties after leaving the plants. Daily and at the end of the season, they returned to neighborhoods along back roads and inside small coastal communities that few people who eat the fruits of their labor will ever see,” Griffith writes.

But by the mid-1980s, fewer local women, white or black, were seeking the seasonal picking jobs that would send them home with the smell of crabs and a paycheck based not on hours, but on the pounds of meat picked. Griffith is able to compare the introduction of the workers on H2 visas from Mexico to the use of foreign workers in other industries including apple picking and sugar cane harvesting.

The crab-plant owners’ choice to use the Mexican workers came not just from cost accounting, but more importantly as a means of labor control, Griffith explains. With an H2 visa, the foreign worker can work for only one employer for one season.

Griffith draws a comparison between the earlier relationships between plant owners and local crab pickers, and not surprisingly, he uses the sea to explain. “We find a similar relationship between groupers and wrasses around ocean reefs,” he writes.

Normally, the two species get along, with the wrasse getting meals by cleaning the grouper’s scales. But, as in nature, such relationships sometimes shift.

In the case of the crab plants, alternative opportunities for the local workers — such as jobs in the tourism industry or classes at nearby community colleges — reduced their desire to take the seasonal work. With the H2 workers, plant owners could set their plans for the entire season.

One of his favorite images is of a couple in a boat with a dead deer.

With a bemused smile, Griffith points out that it is the woman, wearing a dress and hat, who is carrying the shotgun in the photo circa 1895. It is obvious that he delights in finding such juxtaposition.

Woman with a shotgun ferrying deer on the New River, NC, c. 1895. Courtesy of the NC Division of Archives and History



Stories of the Sea

Griffith's studies also include community reactions to proposed changes in fishing regulations and to challenges presented by *Pfiesteria*, a sometimes toxic dinoflagellate first discovered in North Carolina waters.

The diversity of topics is invigorating. "North Carolina fisheries are so complex and interesting, you tend not to get bored," he says.

Griffith also participates in the Southern Coastal Heritage Program that provides workshops to help teachers share lessons of the unique ecosystems and communities along our shore. Even though he is "not a big one for sitting on committees," he enjoys the lively exchanges generated by the interdisciplinary panel.

The variety of his experience is apparent in *The Estuary's Gift*, a sum-

mary of Griffith's work through the 1980s and 1990s. The book cites his studies in Florida, Virginia, Puerto Rico, the North Carolina mountains and especially along the North Carolina coast, allowing Griffith to draw parallels between the various locations and industries.

The book also allows him to put the North Carolina coastal experience into historical perspective. In fact, he enjoys the historical research about as much as his fieldwork.

While the book is written in a narrative style without footnotes, he follows the academic tradition of using pseudonyms for the local residents. Thus, he has chosen historical photographs rather than current images to illustrate the various chapters. The archive photos of net fishing and oyster shucking are similar to those in his office and the hallways in the historic Mamie Jenkins Building on the ECU campus.

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The Estuary's Gift is his fourth book, and another on fishers in Puerto Rico is in the works.

Griffith still finds time to write poetry and other creative pieces, but you must page through his vitae to learn of the national praise for his creative work. For example, his short story "Devil's Workshop" took second prize in *Story* magazine's 1998 competition.

That doesn't surprise ECU colleague Margie Gallagher. She knows that his poetry has earned national recognition. But as in his academic work, the projects are not done for praise or glory. "He doesn't need the approval of others," she says.

Then again, poets tend to be underappreciated in our society, she adds. ☐



BEACH EROSION:

Nature's Work-in-Progress

By Pam Smith

Timing is everything. Yolanda and Don Hitko can attest to that. The Michigan transplants moved to Yaupon Beach the day before Hurricane Floyd slammed onto the North Carolina coast.

Its driving winds, tides and floods cut fresh scars on beaches, already struggling to heal from an earlier assault by Hurricane Dennis. Meeting little resistance, Floyd managed to wipe out many remaining dunes, pushing sand across ocean beach roads and into soundside marshes.

Waves crashed up the beach and scoured sand from the base of the man-made six-foot dune that stood between the advancing sea and the Hitkos' new home. The line of dunes that runs along their property and the public access way also took a pounding.

"I believe the dunes protected us," Hitko says. With about \$25,000 worth of property damage, he feels blessed compared to many Oak Island neighbors whose homes and businesses were destroyed by Floyd's direct hit.

Oak Island is in line for a major beach nourishment project in 2004 that will transport sand to widen its beaches and engineer a dune system along its popular ocean front beaches. In the meantime, some sand from the Wilmington harbor relocation project will be placed on part of its sand-starved shores. Traditionally, the town has redistributed sand that could be retrieved in the wake of storms.

"I am definitely a believer in beach nourishment projects and am willing to pay my share," Hitko pledges.

But Hitko knows that beach erosion and beach nourishment are "hot button" topics that evoke as many opinions as

grains of sand on the beaches he would like to see restored.

The catastrophic 1999 hurricane season heightened public awareness of the vulnerability of erosion-prone coastal communities, where beach erosion is a fact of life — nature's work in progress.

Still, storm damage, coupled with mushrooming coastal development, seems to have been a catalyst for new pleas to state legislators for a funding mechanism to address long-term beach nourishment needs.

Coastal Development Regulations in Place

In 1974 the N. C. General Assembly passed the Coastal Area Management Act (CAMA) to coordinate state and federal programs affecting coastal land and water resources, and to promote sustainable coastal development. Among other things, CAMA seeks to preserve natural ecological conditions for the barrier dune systems and beaches, and to safeguard their economic and aesthetic values, says Walter Clark, North Carolina Sea Grant coastal law and policy specialist. CAMA established the Coastal Resources Commission (CRC) as its regulatory arm.

Beginning in 1985, the CRC established building setback regulations based on historical rates of erosion, averaging two to three feet per year. Building relocation and beach nourishment are the preferred CRC erosion control methods. Bulldozing is allowed as an emergency remedy in some situations, Clark explains. And sand-bag placement is permitted only as a temporary measure. Hardening measures, such as sea walls,

Renourishment is a method of placing compatible sediments from another source, usually from state or federal navigational dredge projects, onto the eroded beach. Bulldozing is the process of redistributing sand to provide temporary protection to existing dunes and beachfront structures. It does not add new sediment to the beach from outside sources. Each method comes with a set of environmental criteria.

C o n t i n u e d



Well-designed and engineered dunes — with stabilizing vegetation — are essential to successful renourishment projects.

bulkheads, and jetties, are not allowed.

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For many years, coastal communities have relied on the U.S. Army Corps of Engineers (ACOE) to design and implement beach replenishment programs. Projects must meet environmental impact tests set by CAMA and the federal government, says Tom Jarrett, engineer for the corps' Wilmington district. "The biggest factor for a successful project is the distance we can move the beach seaward, and are able to maintain the distance," he says. A deep, sandy strand absorbs wave energy, while dunes provide a line of defense against advancing wave action.

The pricetag for renourishment varies with the scope of the project and proximity to the sediment source. Federal, state and municipal sources usually share costs. Most beach communities pay for beach rebuilding programs with part of a hotel tax. These taxes are levied by the local governments, but are authorized by state legislators.

Led by Oak Island Mayor Joan Altman, the newly formed North Carolina Shore and Beach Preservation Association wants the state and federal governments to consider a more permanent revenue structure to support renourishment projects. The group says the focus should be on the economic impact of beaches on their communities, counties and the state. Beach residents and tourists annually spend more than \$8 million for each mile of beach, compared to the \$1 million per mile cost for renourishment, the association asserts. Coastal-related tourism pumped about \$3 billion into the state economy in 1998, according to the N.C. Department of Commerce.

Dynamic Systems On the Move

But, barrier islands are much more than economic engines to North Carolina. Sea Grant researchers Charles Peterson and John Wells.

Peterson and Wells study the physical and biological dynamics of barrier islands at the University of North Carolina at Chapel Hill's Institute of Marine Sciences at Morehead City. In their study, "Restless Ribbons of Sand," the scientists explain that coastal barrier islands hug 2,700 miles of our nation's shorelines from Maine to south Texas.

The barriers absorb ocean energies and provide the mainland with a "line of defense against wind and tidal energies and especially against the ravages of frequent winter storms and occasional hurricanes."

To understand what is happening to the barrier islands, Wells and Peterson say it's necessary to understand something about their formation. Geologists theorize that coastal barriers formed as sea level began to rise about 18,000 years ago. Coastlines retreated and ridges of beach dunes were breached by rising water, flooding the lowlands between ridges. These ridges became barrier islands. About 5,000 years ago sea level rise slowed, as the islands migrated slowly to their present positions. Global warming could accelerate sea level rise, they say.

But sea level change is only one factor in the erosion equation. Barrier islands, they say, are part of a "sand-sharing" system. Waves strip away sand from the upper beach and dunes, moving it to the lower beach, or to the continental shelf. In time, waves may push the sand from offshore storage back to the beach and rebuild the dunes.

Sand also can be carried along their beaches. This littoral drift can transport as much as one million cubic yards each year along dynamic barriers such as Cape

Hatteras. Because chains of barriers operate as a system, what one island loses another gains. Inlets that separate the islands often are traps for transporting sand.

The barrier islands also can be reshaped during a storm surge when waves wash over the entire island, dumping the sediment as far as the sound side of the island.

Peterson and Wells are evaluating erosion mitigation methods. They are examining the effectiveness of bulldozing and its impacts on biological resources. Focusing on Bogue Banks, they are studying the impact on shore birds, surf fishes, macroinvertebrates and nesting sea turtles.

Looking at the Sand Beneath the Surface

Most people are surprised to learn that sand is not an infinite resource along the coast, says William Cleary, professor of geology at the UNC-Wilmington Center for Marine Science.

He explains that Cape Lookout separates the coastal system into northern and southern provinces, each with a unique geologic framework that results in uniquely different barrier islands and estuaries. He characterizes the coastal system south of Cape Lookout as sand-starved, ancient "hard bottoms." In contrast, the northern province is underlain by younger sediments, comprised of muds, muddy sands, sand and peat deposited during sea-level fluctuations. The barrier islands also differ in orientation to the shoreline, depth and width of the continental shelf.

Cleary is using high-tech instruments to collect data on the offshore geology to explain the impact of recent hurricanes on North Carolina's coast. He wants to determine the role the underlying geologic framework played in beach recovery along various shoreline

segments. Some, with abundant sand-sharing systems, recovered through natural processes.

However, many severely impacted areas are now at even higher risk due to the historical sand loss produced by the storms. He says that millions of cubic meters of sand were transported beyond offshore barriers, or onto the shoreface — most of which is permanently lost to the natural rebuilding system. With less sand available, the shoreline recedes.

The results of Cleary's research will help determine the availability of sediments suitable for future beach renourishment projects. His results also

will help agencies such as the N.C. Division of Coastal Management refine their management strategies in light of shoreline differences.

Looking for Effective Remedies

Some scientists have adopted a "let nature take its course" position in dealing with beach movement. Stan Riggs, East Carolina University geology professor, recently told a state legislative committee that urban-style development is no match for the dynamic nature of barrier islands. He warned that a Category 4 or 5

Spencer M. Rogers



Atlantic Beach received sand from the Morehead City port dredging in the mid-1990s.

hurricane could "break up the Outer Banks."

There are alternatives, says Spencer Rogers, North Carolina Sea Grant coastal erosion and construction specialist. He says that a well-designed beach nourishment project can be efficient, effective and environmentally friendly.

Working with beach communities to evaluate the impact of hurricanes Dennis and Floyd, he found the closely spaced storms destroyed 65 buildings between Currituck and Sunset Beach. Another 903 that were threatened by erosion were considered repairable.

Rogers was especially interested in the fate of the structures behind nourishment projects at Wrightsville, Carolina and Kure beaches, where Floyd's 75-year surge event occurred. These publicly funded nourishment projects, were designed by the ACOE for both long-term erosion and hurricane protection.

Each included higher elevation dunes and a wider beach. Not a single building behind these engineered dunes was lost.

Carolina and Wrightsville beaches are two of the oldest projects continually maintained by the corps. From 1965 to 1998, the Carolina Beach program has cost \$26.3 million, while the Wrightsville program has cost \$16.7 million. The figures reflect combined federal, local and corps funding sources. The Kure Beach program, implemented in 1998, cost \$10 million for wider beaches, dunes, public walkover access and the extension of storm water outfalls.

Rogers says that recent hurricanes show that where sand is available, a well-planned and maintained nourishment program can be an effective option. However, the method requires a long-term commitment to add sand every two to four years. Nor is it the best solution for every erosion problem. It may not be

cost-effective in areas with high erosion rates, or where sources of beach-quality sand are scarce.

Hardening of shorelines is not in the mix of remedies for the North Carolina ocean front, Rogers points out. Sandy beaches disappear in front of seawalls and bulkheads. Groins or jetties increase erosion for neighboring properties.

Cleary, Riggs, Rogers and Wells are members of the CRC Science Panel, established in 1997 in the wake of Hurricane Fran to help re-evaluate shorefront erosion rates and inlet changes.

While some scientists may find beach nourishment the more benign of the engineered erosion remedies, they demand continued, tough environmental impact standards for the CAMA permit process. Measures include monitoring the biological impacts of sand placement; monitoring effects on recreational and commercial fishing habitat; determining the suitability of the sediment to be placed on the beach; and ensuring public access to beaches.

Finding an equitable funding process for long-term beach renourishment projects can get sticky. The question of "who pays" often is a major stumbling block.

In March, Carteret County voters rejected a \$30 million bond referendum to finance a 10-year beach nourishment project for nearly 17 miles of Bogue Bank beaches. The proposal called for levying a special tax in separate tax districts for oceanfront and non-oceanfront property owners. It would have been the first time a local municipality had completely financed a major beach nourishment project.

Adrienne Cole, executive director of the Carteret County Economic Council, explains that it was designed to be a stop-gap measure as the county moves through the lengthy approval



Spencer M. Rogers

Sandbags are permitted only as a temporary emergency measure.

process for a proposed ACOE project. Such projects usually take about 10 years from application to implementation, and parallel CAMA's stringent permit regulations.

In the meantime, the county will move forward with a smaller project to pump sand from the Brandt Island sand disposal site onto Indian Beach. A portion of the county's hotel tax will fund the project.

Cole says, "I don't think the county vote was against renourishment. Rather, it was more about the way this proposal was structured. I think that all citizens of Carteret County understand that this is a critical economic issue for the county."

Retreat is Still an Option

Time was, that North Carolinians simply retreated in the face of the often powerful combination of nature: storms and the shifting islands, says Carmine Prioli, North Carolina State University English professor. Prioli is the author of *Hope for a Good Season: The C'ae Bankers of Harkers Island*.

After the storm of 1899, residents of Shackleford Banks picked up and moved to the mainland, leaving the island forever. Now a wilderness area in the Cape Lookout National Seashore, the island is known for its wild horses and breathtaking maritime forest.

Other communities along the Outer Banks dealt with advancing seas and erosion in less drastic ways, Prioli says. They simply retreated up the shoreline out of harm's way. A cottage industry of

house movers actually grew out of the retreat policy.

In more recent memory, the Cape Hatteras Lighthouse became an icon of the retreat policy, Prioli notes. The nation held its collective breath in March 1999, as the 100-year-old landmark was moved 3,000 feet away from the reach of the sea.

Relocation of buildings still is an effective option for some beach property owners. Between 1989 and 1995, about 250 buildings along the coast were moved landward either on the same lot, or to other lots.

"Retreat served us well as a policy for generations," says Nags Head Town Manager J. Webb Fuller. It was a policy that most could live with — as long as the population remained low, and home sites were deep enough to accommodate the ebb and flow of the shoreline.

Much of the Outer Banks' mushrooming growth took place between 1975 and 1995, decades of low storm activity. Now, building lots are smaller, houses larger and both are more costly. For many, there may be nowhere to move.

"We are constantly juggling erosion,

both chronic and catastrophic," Fuller says. "As a community, we now are looking at beach nourishment as a policy that better fits the economic reality of today."

He adds, "Sea walls or bulkheads are just not an option here. The beach is public domain. Once you harden the shoreline, you eliminate the public beach. We have, and the state has, always championed public access."

Like his colleagues in the beach and shore association, Fuller would like a dedicated funding source at the state level as leverage for long-term management programs that have the greatest economic and environmental return for citizens and visitors.

"The state has a responsibility to its citizens to maintain its infrastructure," Fuller says. "That includes roads, water systems and other assets. And in the case of beach towns, the most valuable asset we have is our beach. We can choose to ignore its maintenance needs, or to maintain it. If we ignore it, it will go away. So it makes sense to look at the quality of all our public resources." □



The 1999 hurricane season wrecked havoc on Oak Island — washing away beaches, dunes, homes and roads.

Repair and Rebuild

After the Storms

By Pam Smith

The evacuation orders went out and Oak Island residents responded to the need to leave. No one wanted to stare down their late summer, unwanted guest. Floyd wobbled just off the coast, threatening to strike with Category 5 deadly force.

By the time he made landfall, Floyd's wind force had been downgraded. But, as the storm made its way inland, it was clear that the toll would be high for the Brunswick County community of 7,000, Oak Island Mayor Joan Altman recalls.

The beach town took a direct hit from a powerful storm surge and a continuous pounding from high tides, torrential rains and flooding.

The sandy beach and man-made dunes along four miles of its 10-mile oceanfront were decimated. Precious beach sand washed across the ocean road and was deposited onto second- and third-row lots.

Floyd destroyed 50 homes. None are likely to be rebuilt on their prestorm sites, Altman says. Waves demolished some of the older cottages and washed away their building lots.

Some newer homes, built according to wind-resistant standards on required deeper pilings, withstood the onslaught. They appear to be intact, but their building lots, septic systems and septic fields now lie under the surf. Relocating these to new lots could be the only option for homeowners.

Others are in what could be called recovery limbo. Some houses that sustained more than 50 percent damage may meet a Coastal Resources Commission (CRC) litmus test for repair or replacement. But, if Floyd has moved

the shoreline landward and erased the vegetation line originally used to determine the setback line, it may not meet the new setback requirement.

There is little chance that the sand-starved beach will soon recover through the natural erosion-accretion process. And Oak Island is not due for a major beach renourishment project until 2004, when the U.S. Army Corps of Engineers is slated to pump tons of sand to widen the beaches and construct and vegetate protective dunes.

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Though erosion is a way of life for coastal communities, Altman says, "It is still sad. This represents a major loss to our families and to our community." Many of the lost cottages had been in families for three generations. Others were second homes. Some were rental properties.

Hurricane Floyd has presented recovery challenges for state regulators, local governments and private property owners alike, says Walter Clark, North Carolina Sea Grant coastal law and policy specialist. Telling property owners that they cannot rebuild is never an easy task, he adds.

From the start, the CRC attempted to balance redevelopment in ocean hazard areas with safety, social and financial considerations. Commission members recognized that

North Carolina's coast is subject to annual threats from storms, shifting coastlines and the natural erosion-rebuilding cycle.

"The CRC understood that they could not remove all risks associated with living along the coast, so they tried to reduce the dangers by implementing stringent management policies and standards," Clark explains.

Setback restrictions are most significant. The CRC rules require that a setback be established at a minimum distance from the first line of stable, natural vegetation depending on the size of the structure. For a single family residence and other structures 5,000 square feet or less, the setback is determined by multiplying the annual erosion rate by 30. The setback line must be at least 60 feet from the first line of stable, natural vegetation.

Because large structures pose increased risk to life and property, structures with more than 5,000 square feet require twice the setback — no less than 120 feet from the first line of vegetation.

Shorelines can erode significantly during hurricanes. When the storm passes, property owners, such as those at Oak Island, may have to deal with a variety of situations.

The structure or vacant lot may fall landward of the vegetation line, but within the minimum setback area. If the structure has sustained damage less than 50 percent of its value, the homeowner can institute repairs without a permit. However, if the damage is more than half its value, the property owner must obtain a permit from the N.C. Division of Coastal Management or local government before rebuilding.

Vacant lots may be developed if the development is set back from the ocean the

maximum extent feasible and the development is designed to minimize encroachment into the setback area. The development must be at least 60 feet landward of the new vegetation line; and the development is located entirely behind the landward toe of the dune.

Vacant lots closer than 60 feet from the vegetation require a variance for development. Other options to a landowner whose poststorm lot may be unsuitable for development is to wait and see if the beach naturally recovers and re-establishes the vegetation line further seaward.

Or, the property owner might consider encouraging a community effort to artificially nourish the beach. This is costly, and the first line of stable vegetation becomes permanent at the time beach nourishment begins.

Two more options are available, says Donna Moffitt, director of the Division of Coastal Management. Property owners can hope that the local government will purchase their property under a grant from the Public Beach and Coastal Waterfront Grant Acquisition Program. The program gives priority to lands that have been made unsuitable for development as a result of natural hazards, she explains.

Another option is for landowners to donate their unbildable lot to the state, local government, or a qualified nonprofit organization in return for a tax credit under the Conservation Tax Credit Program operated by the N.C. Department of Environment and Natural Resources.

For structures that are imminently threatened by erosion, the CRC allows property owners to apply for permits to use sandbags and/or bulldozing as temporary erosion control techniques. An imminently threatened structure may be protected only once with sandbags.

Beach bulldozing must adhere to strict regulations. More importantly, beach bulldozing is prohibited during the sea turtle nesting season May 1 through Nov. 15. ■

As evidenced by the photos at right, the 1999 hurricane season left some coastal property owners stranded.



Scott D. Taylor



Scott D. Taylor



Spencer M. Rogers



Courtesy of the State Port Pilot

Floyd Follow-up

The Lingering Effects

By Katie Mosher

As spring turns into summer, North Carolina Sea Grant researchers have a watchful eye on coastal waters — and they will have some high-tech eyes as well.

Efforts to determine lingering effects of unprecedented flooding last fall will be bolstered by monitors on state ferries, remote imagery from the SeaWiFS satellite of the National Oceanic and Atmospheric Administration (NOAA), and permanent monitoring stations along the Neuse River and estuary.

And there may be one silver lining in 2000 to the devastating hurricane season of 1999: Outbreaks of toxic *Pfiesteria* are usually low after major storms.

"I am hoping we will have a quiet year," says JoAnn Burkholder, an aquatic botanist at North Carolina State University and expert on *Pfiesteria*.

The flooding that accompanied Hurricane Floyd had identifiable short-term effects on coastal waters: an increased load of nutrients and decreased levels of oxygen and salt in estuaries.

While the fast-moving Cape Fear system may have recovered fairly quickly, the turnover is much slower in the Pamlico Sound, a major nursery area that is still showing signs of stress.

"We are finding much smaller yearlings. Fish that should have been 6- to 8-inches by spring were still only 4-inches long. Clearly, their reduced growth is linked to the stressed environment," Larry Crowder, a marine biologist at the Duke University Marine Lab, says of sampling in the Pamlico.

Crowder and others will continue to

monitor various species as they advance through the life cycle this year. He expects to see other signs of prolonged stress on fish that were trapped in the sound when Floyd's freshwater plume arrived.

Such data would support laboratory findings of NC State zoologist James Rice, graduate student Regan McNatt and Edward Noga of the NC State College of Veterinary Medicine. The team studies the impact of low levels of oxygen — known as hypoxia — on the feeding, growth and immunity of juvenile estuarine-dependent fish.

They found that fish exposed to low-oxygen rates for prolonged periods had reduced growth rates and weakened immune systems.

"Although it is well-documented that acute hypoxia can lead to fish kills, few studies have measured the direct effects of sublethal hypoxia on fish," says Rice.

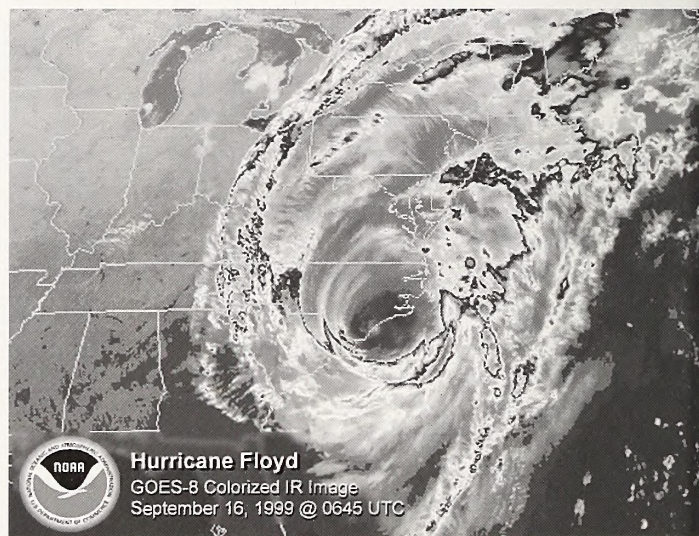
"Increased vulnerability to disease may lead to greater mortality, and decreased growth can also reduce production by fish populations." In particular, the study found that natural antibacterial activity decreases as dissolved oxygen levels decrease.

SIGNALS AND CYCLES

Why did some commercial fishers report record landings in the fall, while others qualify for disaster assistance because of limited catches?

Some researchers and state officials suggest that heavy rains from Hurricane Dennis — which lingered on North Carolina's coast for two weeks — may have dumped enough fresh water into the Pamlico and upper estuaries to signal more mature sea life to leave the sound. Some fishers were well-positioned for the bounteous catch. Changes in traditional fishing grounds could continue.

Thus researchers also are following the



fate of the larval fish that are transported from the open sea into the sound's nurseries in March and April.

Will the low salinity levels hinder the larval fish, including croaker, flounder and pin fish that support North Carolina's lucrative fisheries?

Or, Crowder asks, "Could larval fish actually benefit from the additional nutrient



Larry Crowder (center) and graduate students examine fish from a Pamlico Sound trawl.

levels that remain on the bottom of the sound and estuaries?"

Additionally, upriver habitat is still recovering from the triple dose of storm upheaval. If sea grasses — habitat for gag grouper — do not make a comeback, this year's class of fish could be affected.

The jury still is out on overall effects to North Carolina fisheries, researchers and state officials agree. Mother Nature's final answer will depend on the prevailing weather in spring and early summer.

Warm sunny days could feed algal blooms with more light. Organic materials and fungi will use oxygen to decompose. A wet, warm spring and summer could add more fresh water and nutrients.

What is the best case scenario? A dry and windy spring could evaporate fresh water trapped in the Pamlico and promote its recovery, Crowder says.

The researchers find themselves in new territory as they evaluate the cumulative effects of Hurricanes Dennis, Floyd and

Irene, which hit the North Carolina coast within a four-week span in late summer and early fall. Scientists have limited data from 1954-1955 — when four hurricanes hit North Carolina in a 12-month period — to help predict how the fisheries will recover.

"This is an opportunity to do groundbreaking research that will help predict, but more importantly help guide management policies of how to manage our resources at a time of greater levels of disturbance," Crowder says.

THE PAMLICO PUZZLE

A small armada of scientists will continue studying the hurricane effects up and down the coastline. The interdisciplinary effort — including several Sea Grant-funded studies — began with a rapid response.

"We virtually commandeered the Duke and UNC research vessels," Hans Paerl, a Sea Grant researcher at the University of North Carolina's Institute for Marine

Sciences, recalls the days after Floyd hit.

Researchers teamed up with state agencies to launch an immediate assessment of water quality and fisheries habitat in the Pamlico Sound — the nation's second largest estuary and deemed by many to be the state's most valuable aquatic resource.

The Pamlico processes nearly half of the state's freshwater runoff via its subestuaries — Neuse, Pamlico, Roanoke-Chowan-Albemarle. But that process is slow — with a mean water retention time of about one year, Paerl says.

Academic researchers parlayed their resources with teams from the state's ongoing Neuse River Modeling and Monitoring Program (ModMon), and NOAA's fisheries lab in Beaufort. The fleet of researchers already was on the scene with cameras and monitoring devices as Floyd's deluge inundated the sound and swollen freshwater tributaries, and flushed a dark brown plume of sediments and organic waste into the Pamlico.

Early measurements caused concern because the salinity levels of the Pamlico plummeted. Bottom-water measurements indicated low oxygen and elevated inorganic nitrogen and algal production levels in the western sound. The Pamlico had virtually stratified, with a freshwater layer atop a salt-water bottom layer. Trawls of the region yielded dead and dying shrimp and blue crabs, and bloated fish with tail rot, skin sloughing and lesions.

Hurricane Irene arrived as a mixed blessing. Though already-flooded eastern North Carolina was wont to receive another dousing, Irene's winds "stirred" the Pamlico, mixing salt and fresh waters and temporarily releasing oxygen to stressed finfish and shellfish.

Stratification reoccurred and oxygen and salinity levels remain lower than normal, but massive fish kills did not happen. And through the winter months, signs of disease dropped.

Continued

But by the spring, the sound was still fairly fresh and chlorophyll levels were elevated in the nutrient-rich waters. "What normally happens in the Neuse in late February has moved into the sound," says Paerl, who is monitoring algal growth. "There is potential for freshwater species to move into the sound."

Burkholder's team also is monitoring the river, estuary and sound with the placement of automated platforms that will offer a stream of data rather than sporadic sampling. "It's the difference between a snapshot and a movie," she says.

Unlike the fish kills that came with Hurricane Fran, the sound had oxygen levels on the rebound eight weeks after Floyd, Burkholder says. But, Floyd's legacy may be a "flanking effect" of nutrients deposited in the estuary.

"We will continue to track water and biological quality in the Neuse and western

sound during the coming year, with major focus on the estuary in evaluating the extent of delayed impacts that may be sustained from the hurricane," she says.

CAPE FEAR QUESTIONS

While the Pamlico Sound has a long retention rate, the Cape Fear River moves quickly toward the coastal ocean. University of North Carolina at Wilmington researchers Martin Posey and Troy Alphin study the effect of storms and hurricanes on bottom communities in the Cape Fear River.

"The passage of hurricanes Fran and Bonnie were associated with dramatic declines in bottom communities," says Posey, a professor at the University of North Carolina at Wilmington.

"The animals did not recover until the following summer. Preliminary data suggest that an abundance of bottom animals seemed to recover more quickly

after Hurricane Floyd."

Meanwhile Larry Cahoon, who heads an interdisciplinary coastal ocean program at UNC-W, investigated the effects of Hurricane Floyd flooding on ocean water quality.

The flood caused the highest single daily discharge of the Cape Fear River in the last 50 years. After sampling the river and its plume, Cahoon found that nutrient concentrations weren't any higher than the same period the year before.

"Although large quantities of animal and human waste were likely washed into the Cape Fear by hurricane flooding, the large rainfall volume diluted these contaminants, preventing more serious water impacts on the coastal ocean," says Cahoon. ☐

For statistics on Hurricane Floyd, check the National Climatic Data Center's site on the Web: www.ncdc.noaa.gov and follow the links to the climate extremes and satellite images.

FLOYD'S ECONOMIC IMPACT TALLIED

East Carolina University researchers estimate businesses in the coastal plain suffered \$4 billion lost revenue and another \$1 billion in physical damage. In spite of their losses, most businesses participated in community relief and recovery efforts, contributing an average of \$5,800 to those programs.

The ECU team, with funding from North Carolina Sea Grant, is studying the socioeconomic impact of Hurricane Floyd on businesses in the 44 hardest-hit counties. They report three-fourths of the businesses in those counties shut down because of the storms and floods. The shutdowns varied from five to eight days depending upon the locale.

Months after the floodwaters receded, ripples of loss are still being felt on the economy. Almost 10 percent of the businesses that experienced some storm damage reduced their labor force. Projected across the region, that adds up to about 31,000 lost jobs.

The study, conducted by faculty members from sociology, economics and the university's Survey Research Laboratory, reflects telephone interviews with more than 2,400 businesses. Construction, manufacturing, transportation and utilities, wholesale, retail, tourism, agricultural and service sectors were sampled.

Most businesses survived the storm, and are back in operation. However, small businesses in the most severely impacted region have not resumed operation.

Road closures had the longest impacts on businesses that identified infrastructure problems. Road problems were especially hard on medium and small businesses in severe- to moderate- impacted counties. Loss of water and power had the second and third greatest impact.

Most businesses reported having some insurance, but one out of every six small businesses had none. While most had liability, property and casualty and fire insurance, most were not insured for loss of revenue or floods. Less than half of the

businesses reported having insurance that covers the replacement cost of their losses.

For 375 firms reporting physical damage, the average cost was nearly \$40,000.

Expansion plans have been put on hold by most businesses. Before the storm, nearly 15 percent of the small businesses and 17 percent of the medium-sized businesses had plans to expand. This dropped to 12 percent and 5 percent respectively after the storm. Before the storm, about 25 percent of the large businesses had expansion plans. After the storm, this dropped to 7 percent.

ECU faculty members who participated in this study include John R. Maiolo, John C. Whitehead, Marieke Van Willigen, Robert Edwards, Paula Harrell and Kenneth Wilson, and graduate students Kelly Arena and Genuan Gunawardhana.

Further impact studies will be released at the ECU hurricane conference, May 24-26 at the Greenville campus. For more information, call 919/515-7990 or check the Web at www.ecu.edu/coas/floyd/.

— P.S.



Scott D. Taylor

Maritime Forests:

Where Beauty and Science Converge

By Pam Smith

When the first European settlers set foot on the Outer Banks shores, they were searching for New World treasures of gold and precious gems, says David Kelmer of Hatteras Island. What they found was even more precious — life-giving maritime forests with dense stands of live oak and pine, fresh water ponds, and an abundance of deer and small game.

Continued

Maritime forests still take visitors by surprise, says Kelmer, a tree surgeon and volunteer at Buxton Woods. "They are not what people expect to find at the beach."

The 825-acre Buxton Woods Reserve is a maritime evergreen forest dominated by loblolly pine, live and laurel oak and red cedar. Its fresh water "sedge" — a pond some three miles long — is the source for the largest aquifer on the state's barrier islands.

The ocean-to-sound hiking trail Kelmer helped construct is a variation of his early Hatteras Island vacation adventures. He remembers Buxton Woods as a retreat from sun, sand and relentless ocean breeze, and as a place of great beauty and endless natural discoveries.

Relatively few studies have been published about the rare and slowly disappearing maritime forests, which are unique to barrier island strands from Maine to Florida.

Though scientists still ponder their origins, there is consensus that maritime forest systems provide storage for ground-water and refuge for wildlife, and help stabilize the soil. Occupying the more stable portions of the islands and coastal dune ridges, their plant and animal life are well adapted to survive constant exposure to salt water spray, limited availability of fresh water, soil erosion, dune migration, periodic seawater inundation, wind damage and frequent ocean storms.

Along with Buxton Woods, North Carolina's narrow barrier islands offer uniquely diverse maritime forests, including Currituck Banks, Kitty Hawk Woods, Nags Head Woods, Shackleford Banks, Emerald Isle, Zeke's Island and Bald Head Woods.

Vegetation varies because of the gradual climate transition from south to north along the Outer Banks, explains John Taggart, executive director of the North Carolina Coastal Reserve Program. This explains why cabbage palmettos trees are in evidence at Bald Head Woods, the most southern site. Currituck Banks, the most



Lush maritime forests take beach visitors by surprise.

northern site, displays a greater proportion of deciduous canopy trees.

Each has special characteristics and beauty, Taggart says. For example, Nags Head Woods is noted for its 60-foot dunes and 500-year old pine and hardwood trees; Buxton, for its windswept live oaks; and Kitty Hawk, for its old dune ridges, deep swales and wetlands where cypress thrive. Shackleford Banks, part of the Cape Lookout National Seashore, is haunted by its "ghost forests" — the result of migrating sand dunes filling the forest floor

Taggart points out that protecting the critical biological and ecological functions of North Carolina's maritime forests has become a collaborative effort among environmental organizations, local municipalities, state and federal agencies. For example, the Coastal Reserve Program partners with The Nature Conservancy and U.S. Fish and Wildlife at Currituck Banks, with the National Park Service at Buxton Woods, and with the town of Kitty Hawk at Kitty Hawk Woods.

He credits the North Carolina Chapter of The Nature Conservancy for leading the way for the acquisition of much of the state's remaining maritime forests.

The Nature Conservancy manages Nags Head Woods, which Congress



Barbara Blonder, northern sites manager, checks on a water quality project.

designated as a National Natural Landmark in 1974. When the conservancy chapter was established in 1979, protecting the forest was one of its first projects, an effort initiated by the local garden club.

Working with the towns of Nags Head and Kill Devil Hills and the Friends of Nags Head Woods, The Nature Conservancy has helped preserve 1,200 acres of this threatened ecosystem over the years.

Janet Owen, development director for Nags Head Woods, attributes that success to a community that understands the importance of biodiversity — from rare orchids that appear seasonally on the forest floor to water violets on its fresh water ponds. The wealth of wildlife includes river otters and migratory waterfowl. Importantly, the freshwater aquifer is the community's source of water.

And, oh yes, Owen asks, how many places can you find Spanish moss hanging from a holly tree?

Nags Head Woods boasts public education programs that include summer ecology camps for kids and adults. A well-marked, five-mile trail is easy to navigate and features a short-cut loop for the less experienced hiker. From early spring through late fall, volunteers lead interpretive walks.



Drifting sand creates a 'ghost' forest effect within the maritime forest.

While nearby Kitty Hawk Woods has limited public access, Barbara Blonder, Coastal Reserve northern sites manager, welcomes school groups and community organizations. Here is a chance to walk along the relics of dunes left by the Atlantic Ocean as it receded during the Pleistocene epoch, she says. One of the largest of the state's maritime forests, it contains examples of both maritime deciduous forest and maritime swamp forest environments. A community of evergreen and deciduous hardwoods dominate the upland ridges, while thick stands of bald cypress dominate the swamp forest.

As a biologist, she is fascinated with how nature's processes work together. Where better to study such synergy than the rare and diverse habitats of Kitty Hawk Woods? Blonder hopes to expand its use as an educational resource and a low-impact research laboratory. Currently, a botanist from St. John's University is trying to determine the reason for the decline of the woods' dogwood trees. He also is studying the life history of the crane-fly orchid. Another scientist from Oak Ridge National Laboratory is conducting water quality studies to track how naturally occurring organic compounds move through organic soils.

Blonder also oversees the maritime forest on Currituck Banks and co-manages Buxton Woods with Marcia Lyons, site biologist for the National Park Service.

Lyons describes the Buxton Woods Reserve as a "magical" place where beauty and science intersect. Reserve habitat includes all the elements that define a maritime forest: maritime evergreen forest, maritime shrub swamp, sedges (inter-dune ponds), maritime shrub thicket and salt marsh environments. Its Jeannette Sedge, the largest of its fresh water ponds, is the source of water for all of Hatteras Island.

Looking at the windswept beauty of the live oak forest, the questions tumble out: How can these beautiful live oak trees thrive in a mere inch of topsoil? How can they survive the constant assault of sea spray? How do they survive the daily winds and frequent storms?

Adaptation, she explains. The reduced leaf size and waxy cuticles help reduce penetration of the salty spray. She cites botanist Vincent Bellis, East Carolina University professor emeritus and former Sea Grant researcher, who compiled a review of maritime forest-related literature about five years ago. Bellis suggests that because evergreen trees continually lose their leaves rather than seasonally, the litter

provides a continuous, but low, supply of minerals. Evergreen species also have the capacity to photosynthesize even during the winter months.

While the primary canopy of any maritime forest is important, so is its "understory" of herbaceous plants, vines, and shrubs that contribute to the forests' stability. Bellis fears that clearing this undergrowth for development in the remaining maritime forests not in protected areas will destroy the regenerative ability of existing plant life.

Citizen advisory councils at each protected maritime forest site play vital roles in developing management plans for the forests. Members help to inform policy-makers responsible for land-use plans in adjacent communities.

Volunteers such as Kelmer understand the value and heritage of maritime forests and are convincing advocates. Leading interpretive walks through the Buxton Woods Reserve, Kelmer weaves the science, the history and the local lore to create a sense of place.

He tells visitors they are standing atop a sand bar some 5,000 feet deep, about 31 miles from the mainland; that the Algonquin Indians were the earliest inhabitants of the woods; and that colonial settlers discovered that the density and strength of live oak wood was well-suited for ship building.

He tells them that the maritime forests have been thinned dramatically by modern day expanding development. And he tells them that, by the way, these rare, complex and mysterious maritime forests hold the barrier islands in place. □

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- Marcia Lyons, field biologist
Buxton Woods Reserve/Cape Hatteras National Seashore, 252/995-6968

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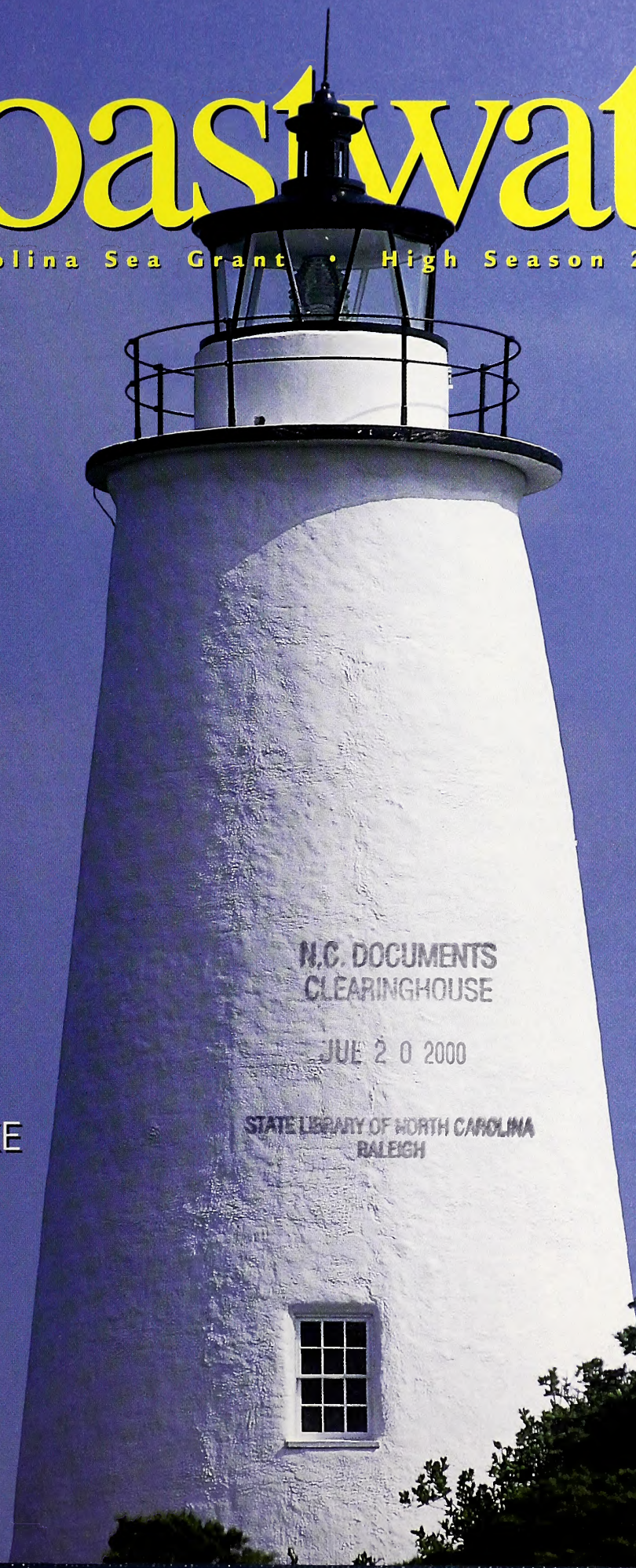
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Catching Up

There's no doubt about it: Summer is here. The days are long, hot and humid.

But as I gather my thoughts, I feel as if I am writing one of those holiday letters — you know, where you brag about the family and share news about friends.

First, the bragging.

Earth Day 2000 had special meaning as we joined the National Oceanic and Atmospheric Administration in honoring Lundie Spence as an environmental hero. For more than 20 years, Lundie has been a leader in environmental and marine education in North Carolina. One of her greatest gifts to North Carolina has been her ability to connect people — often from diverse agencies or backgrounds — to get a job done. She brings together researchers and regulators, teachers and museum staff.

At our reception honoring Lundie, the stories flowed. There was the time she dropped spread-eagle on a trail to explain the nature of low-growing shrubs. And there was the graduate student from Brazil who needed kitchen pots. Lundie knew someone with a set gathering dust.

Sea Grant colleague Barbara Doll was a graduate student when she met Lundie, then advisor for a student environmental club. "I knew I wanted to be like Lundie," she explains.

And Barbara, Sea Grant's water quality specialist and current advisor to the same student group, now is earning accolades for her own extension efforts that create even more partnerships across the state. Details on Barbara's latest honors are on page 3.

Sea Grant offers special thanks to Arthur H. Hemmerlein, a physician in Emerald Isle, for his lifesaving suggestion.

When he saw one of our popular rip current posters, he recalled his own family's panic. "My wife and son were on inner tubes and suddenly they started heading out to sea," he says. "I went out to pull them back in, but I didn't really know what to do. Luckily, we had something to hang onto."

He appreciated the direct nature of the poster — with simple instructions and illustrations — but he needed a smaller size to give



patients, neighbors and tourists. We agreed, knowing the brochures could be distributed at schools, visitor centers and hotels. Nine other Sea Grant programs quickly joined our effort.

Dr. Hemmerlein plans to distribute 5,000 from Swansboro to Cedar Island. Mackinac County in Michigan ordered 7,500 — yes, there are rip currents in the Great Lakes. Orders are coming in from coastal rental agencies and rescue squads. Read more about rip currents on page 4.

If you missed the East Carolina University conference that considered the still lingering effects of Hurricane Floyd on the environment and communities in eastern North Carolina, you can check the conference Web site. Go to www.ecu.edu and follow the links. Sea Grant was a co-sponsor of the event.

Preparation was the buzzword for another event — the second annual Hurricane Expo in Wilmington. Sponsored by Project Impact in New Hanover County, the expo drew a crowd of 8,000. If you missed the home retrofitting workshops by Sea Grant's Spencer Rogers and experts from Clemson University, check the web at www.ncsu.edu/seagrant. Follow the extension link to coastal engineering.

At both the conference and the expo, I enjoyed meeting many *Coastwatch* fans. Colleagues have done the same at other events, including the Engelhard Seafood Festival and Neuse River Day in New Bern. It is always nice to see Sea Grant's old friends and new acquaintances.

On a more somber note, I close by offering condolences to the families of two friends of the coast. Many of you will recall photos of 87-year-old Bill Rice working oyster beds, part of a Winter 2000 story. He died this spring after a yacht swamped his small boat as he relayed oysters with his daughter and son-in-law.

In early June, Dirk Frankenbergh died of a heart attack. The research community knew Dirk for his leadership in marine sciences at the University of North Carolina at Chapel Hill. The public knew him as the author of coastal guides and editor of a new book, *Exploring North Carolina's Natural Areas*.

Katie Mosher, Managing Editor

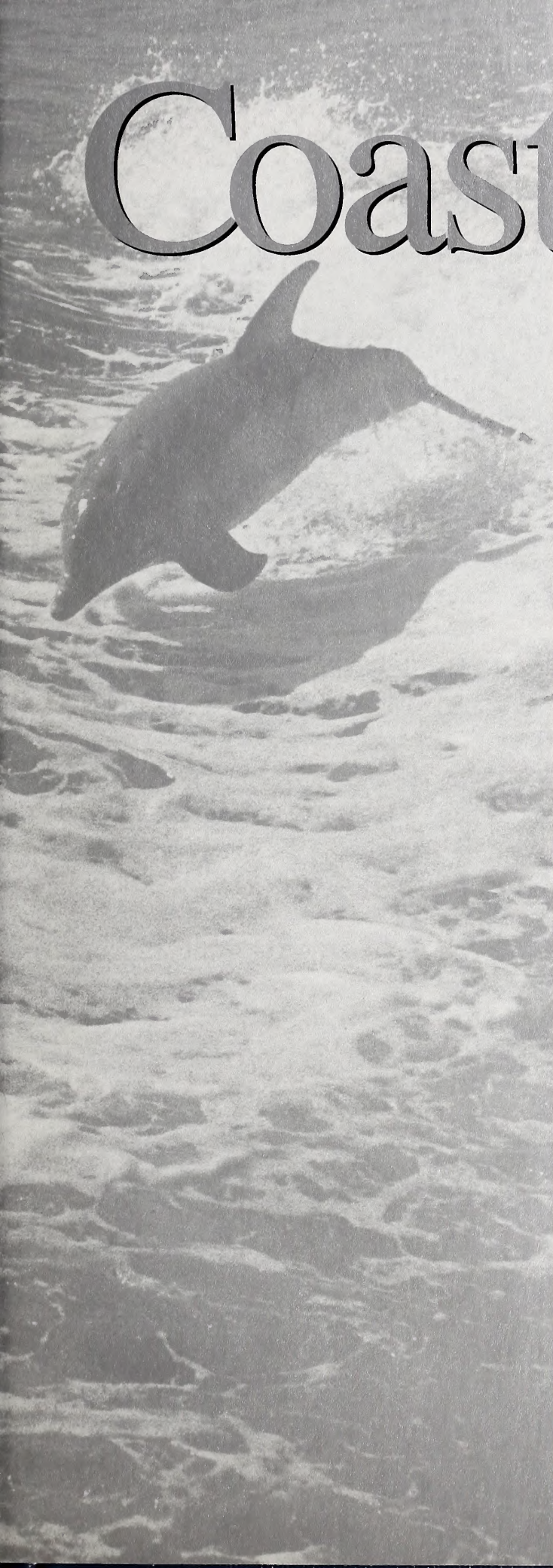
C O N T R I B U T O R S

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Coastwatch

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Coastwatch

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The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 12-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

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Front cover photo of Ocracoke lighthouse
by Michael Halminski.

Table of contents photo of dolphin
by Scott D. Taylor.

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COASTAL TIDINGS

You've Got to Have Heart

Remember Willo, a dinosaur featured in "Take a Walk on the Wild Side" in the spring edition of *Coastwatch*? Well, Willo has gone on to international acclaim since scientists have published their findings: Willo is the world's first known dinosaur specimen with a fossilized heart!



Jim Page

Scientists from North Carolina State University and the N.C. Museum of Natural Sciences published the historic findings in the journal *Science*, just weeks after *Coastwatch* went to press. Until the findings were published, *Coastwatch* could only hint at the importance of the *Thescelosaurus*, a 66-million-year-old herbivore.

According to Dale Russell, NC State paleontologist and the museum's senior research curator, computer-enhanced images of Willo's heart suggest it is a four-chamber, double-pump heart with a single systemic aorta — more like the heart of a mammal or bird than a reptile. The findings suggest that the dinosaur's circulatory system was more advanced than that of modern-day reptiles, and supports the hypothesis that dinosaurs were warm-blooded, Russell says.

Willo is about the size of a short-legged pony. He was discovered in 1993 in South Dakota and was acquired by the museum in 1996. Since then, the fossil specimen has undergone exhaustive, high-tech probes and analysis to unravel its biological mysteries.

On permanent display in the new museum in Raleigh, Willo's grapefruit-sized, reddish brown clump of a heart, is clearly visible within its partially exposed chest.

Images of the fossil, a video and further information are available on the Web at www.dinoheart.org, a site jointly maintained by the museum and the university. — P.S.

In the Next Issue of *Coastwatch*

How are coastal communities grappling with major water issues — quality, quantity and wastewater disposal? Pam Smith will examine the science and the politics of this critical environmental challenge. The peak summer season keeps coastal fishing piers bustling with first-time tourists and veteran anglers alike. Ann Green checks in on several piers — and on the debate surrounding proposals for saltwater fishing licenses.

Second Species of *Pfiesteria* Identified

JoAnn Burkholder, North Carolina State University professor of aquatic botany and Sea Grant researcher, has identified a second species of *Pfiesteria*, *P. shumwayae* (shum-way-eye), from a group of closely related dinoflagellates. The toxic marine organisms are linked to mid-Atlantic fish kills.

Burkholder co-discovered *Pfiesteria piscicida* in 1989 while conducting Sea Grant-supported research. She presented her latest findings earlier this year at the Southeastern Estuarine Research Society conference in Wilmington.

Her studies indicate that *P. shumwayae* appears to thrive best in coastal waters with high nitrogen levels, while *P. piscicida* prefers higher phosphorus levels, although both nitrogen and



phosphorus can stimulate its growth. In addition, *P. shumwayae* is genetically and structurally different. However, both have a complex series of life stages, most of which are nontoxic. Both emit toxins that stun fish during several stages and may cause open sores on

their skin; both then feed on fish tissue and blood. When fish are not available, both can masquerade as microscopic plants.

P. shumwayae was first detected during a 1995 fish kill in North Carolina's New River estuary following a major hog waste lagoon spill. Subsequent testing by Burkholder, her colleagues and independent scientists confirmed the discovery.

Burkholder named the new species in honor of Sandra E. Shumway, professor of biology and marine science at New York's Southampton College. — P.S.

Barbara Doll Doubly Honored

Barbara A. Doll, coastal water quality specialist with North Carolina Sea Grant, has dual honors from North Carolina State University. She was elected to the Academy of Outstanding Faculty Engaged in Extension, and selected by her peers in the Office of Research, Outreach and Extension for the University Award for Excellence.

She is one of eight who will be inducted next fall into the academy, which the university established this year to recognize individuals who advance NC State's outreach and service missions across the state. The Award for Excellence carries with it a \$250 cash prize and a plaque, and is part of the Governor's Award for Excellence program.

For both honors, Doll was cited for her research and extension activities in stream repair, water quality and coastal resource protection, and aquatic nuisance species

awareness. Her outreach programs reach audiences through publications, professional conferences, community workshops and demonstration projects.

Her collaborative project to reduce bacteria and restore shellfish waters in Jumping Run, a creek adjacent to Bogue Sound, was featured in the Holiday 1999 *Coastwatch*.

This spring, Doll worked with university and Sea Grant extension specialists to deliver a series of Coastal Development Workshops to demonstrate best management practices to minimize the impact of development on water quality and shellfish habitat.

Doll earned her bachelor's and master's degrees in civil engineering from NC State in 1989 and 1992 respectively. She joined N.C. Sea Grant in 1992. — P.S.

'A Historian's Coast' Now in Book Form

From Rachel Carson's lessons at Bird Shoal to an account of a stranded sea traveler, historian David Cecelski has taken readers on a variety of adventures in his *Coastwatch* column. Now readers can enjoy the essays in book form.

In *A Historian's Coast: Adventures into the Tidewater Past*, Cecelski takes readers beyond the typical coastal tourist spots or even our famed historic sites.

He shares recollections from Knotts Island and Davis Ridge. He takes readers to the Great Alligator Swamp and to the community of Goshen.

He even discovers natural history — the miracles of bottlenose dolphins and the treasures of paleoecological clues in fossilized *Foraminifera*.

Cecelski, who grew up in the coastal region, is the Whichard Distinguished Visiting Professor in Humanities at East Carolina University. He will tour coastal bookstores this summer. For more information on his schedule, contact John F. Blair Publisher at 800/222-9796.

In the meantime, in this and coming issues, we will have several more installments of Cecelski's column. Turn to page 26. — K.M.

COASTAL TIDINGS

Discover Coastal Artifacts at Wrightsville Museum

During the early 1900s, Wrightsville Beach residents dined on wide screen porches to catch the cool ocean breezes.

An old-style screen porch can be seen on a tour of the Myers Cottage, now home to the Wrightsville Beach Museum. Built around 1907, the cottage is the fourth oldest on Wrightsville Beach. It was moved from its original location on Lumina Avenue to West Salisbury Street in May 1996.

The two-bedroom house features many artifacts from the 1920s and '30s — from an old steamer trunk to a washboard.

The museum also has several displays, including a model of the famous Lumina Pavilion where people crowded to dance to live performances by Big Band musicians.

"Wrightsville Beach was in its heyday during the 1930s," says Linda Honour, museum director. "People flocked from all over to dance at the Lumina."

The museum hours are noon to 6 p.m. Tuesday-Sunday. Admission is \$2 for adults; free for children. For more information, call 910/256-2569. —A.G.

New Recreational Shrimping Blueprint

To restore recreational shrimping in coastal waters, the N.C. Division of Marine Fisheries established a new "recreational gear license" that became effective July 1, 1999.

The annual license allows recreational shrimpers to use limited amounts of commercial gear to harvest seafood for personal consumption.

To help recreational shrimpers choose proper gear, North Carolina Sea Grant offers a four-page blueprint "Recreational Shrimping in North Carolina with Commercial Gear."

Written by Sea Grant marine

extension specialist Wayne Wescott, the blueprint gives step-by-step instructions on how to build a shrimp trawl, and how to set and retrieve a trawl.

To order a free blueprint write to:
North Carolina Sea Grant, NC State
University, Box 8605, Raleigh, NC
27695-8605.

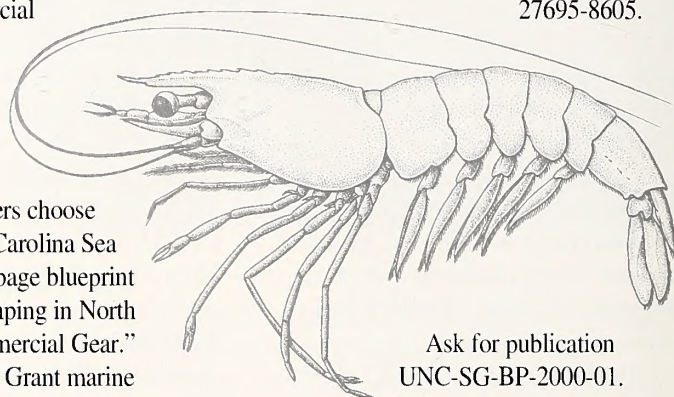


Illustration by John Norton

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—A.G.

Know the Signs of Rip Currents

While the rhythm of ocean waves can encourage relaxation, tourists and coastal residents alike must be alert to the potential for rip currents in the nearshore waters.

North Carolina Sea Grant has a new brochure highlighting dangers of rip currents.

"The key message is: Don't Panic," says Spencer Rogers, North Carolina Sea Grant's coastal erosion and construction specialist. "If you are caught in a rip current, swim parallel to shore."

Powerful enough to pull the strongest of swimmers, rip currents are formed when water rushes out to sea in a narrow path. They may form in a break in a nearshore sandbar, or if the current is diverted by a groin or jetty.

Many rip currents are temporary, others permanent. Often they occur after storms. Watch for these signs:

- A difference in water color — murkier from sediments or darker because of greater depths.

- A difference in the waves. The rip current will have larger, choppy waves, while calmer waves are found closer to shore.

- Foam or objects moving steadily seaward.

- An offshore plume of turbid water past the sandbars.

If you cannot swim across the rip current, float calmly until it dissipates, usually just beyond the breakers — then swim diagonally to shore. If you cannot swim, wade close to shore.

Up to 30 copies of the rip current brochure or the matching poster are available free from North Carolina Sea Grant. Call 919/515-9101. For larger orders, the brochures are 20 cents each; posters are 50 cents each.

Enclose a check with your order and send to North Carolina Sea Grant, NCSU, Box 8605, Raleigh, NC 27695-8605. Sea Grant also has 7-minute rip current videos available for \$6 each.

—K.M.

COASTAL TIDINGS

Sea Grant's Walter Clark to Lead Coastal Society

Walter Clark, North Carolina Sea Grant coastal law and policy specialist, will take the helm of The Coastal Society in December.

Clark is now president-elect of the 450-member, international organization that is dedicated to addressing marine and coastal issues. The Coastal Society brings new information to the table and provides a discussion forum. Its membership includes academic, government and private sector professionals and students.

As president, Clark will oversee an effort to develop regional chapters to foster dialogue among people with common concerns; to establish the society as a clearing house for information on emerging issues; and to draw more students into the professional organization.

A member of the Sea Grant extension team since 1983, his research focus is on land- and water-use issues. Clark developed an ocean management plan for North Carolina and completed a study on user conflicts regarding the state's public trust lands and waters.

He also provides ongoing information on natural resource management for legislative study committees, state commissions, state agencies and local governments.

Clark earned his bachelor's degree in history from East Carolina University, his master's degree in land-use planning from the University of North Carolina at Chapel Hill, and his juris doctor from Wake Forest University School of Law.

The Coastal Society is headquartered in Alexandria, VA. For information, go to its Web site at www.thecoastalsociety.org.

— P.S.

N.C. Aquarium on Roanoke Island Opens

The new North Carolina Aquarium on Roanoke Island opened in May to rave reviews of its "Waters of the Outer Banks" theme.

The centerpiece of the aquarium is a 285,000-gallon ocean tank, featuring a replica of the *USS Monitor*

shipwreck — complete with curious sea turtles, colorful reef fish and restless sharks.

Visitors can explore an array of aquatic habitats from the ocean and inlets to sounds and estuaries; and from saltwater marshes to freshwater streams and roadside ditches — each with unique communities of animal and plant life.

A walkway leads to outdoor exhibits along the Croatan Sound where the effects of tides, weather and water can be seen. Skates and rays, crabs, sea stars and urchins provide additional hands-on learning in the



Discovery Gallery.

Expansion projects are under way at state aquariums at Pine Knoll Shores and Fort Fisher, with themes based on their distinct geographical coastal settings. The Fort Fisher facility will be closed until 2002.

The Pine Knoll Shores site remains open as renovations continue.

Administered by the N.C. Department of Environment and Natural Resources, the aquariums on Roanoke Island and at Pine Knoll Shores are open seven days a week from 9 a.m. until 7 p.m. Admission is \$3 for adults; \$2 for senior citizens and military personnel; and \$1 for children ages six to 17. Admission is free for children under the age of six and for school groups.

For information, call 800/832-FISH, or log on www.ncaquariums.com.

— P.S.

Digging into History

Archeologists are surveying Roanoke Island, but they are not in search of the famed "Lost Colony."

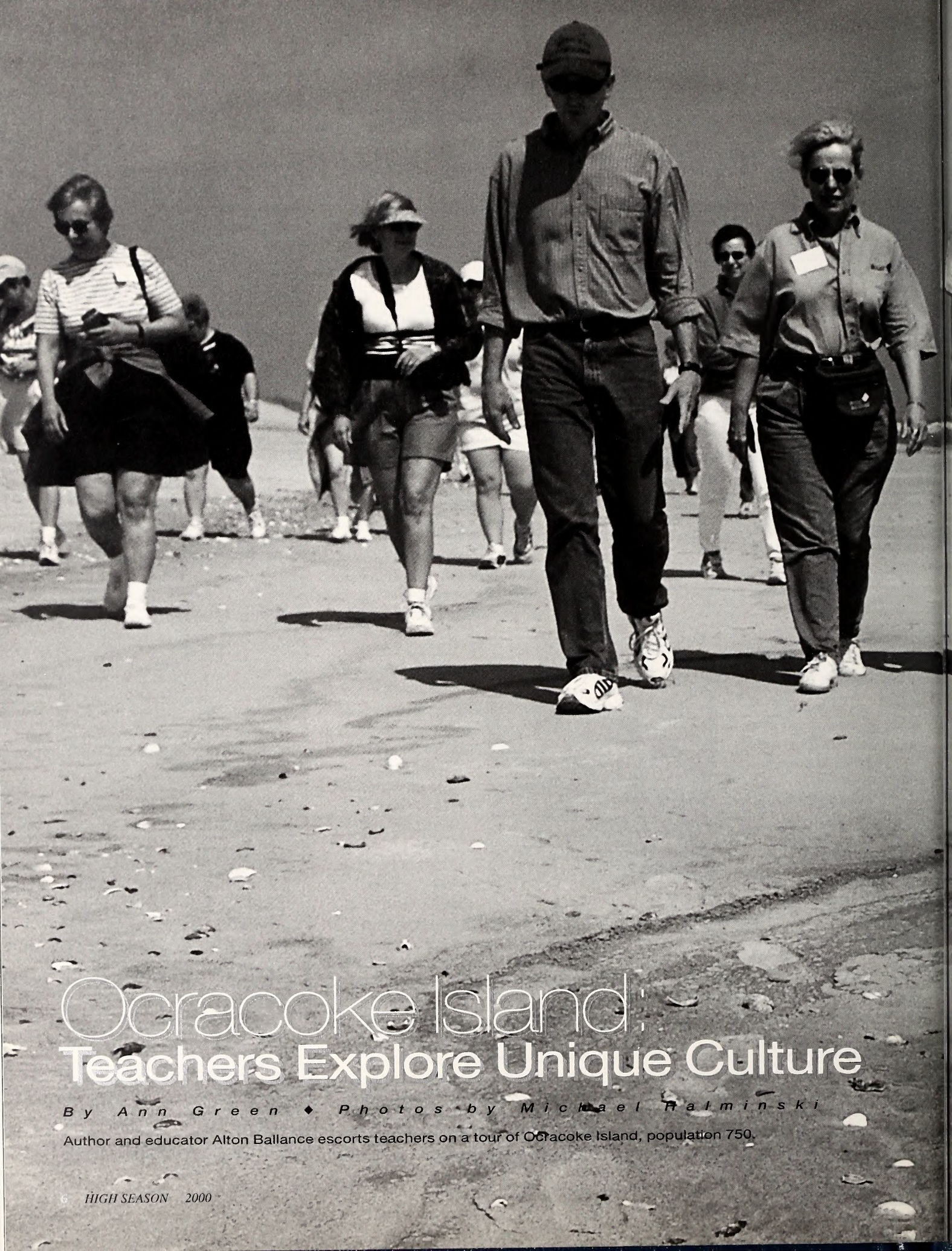
Rather, the team from the National Park Service's Southeast Archeological Center is looking for artifacts from the Civil War era, the Freedman's Colony and a Depression Era camp for the Works Project Administration.

The project is in the Fort Raleigh National Historic Site in Dare County. The work focuses on a northern section of the island, part of 202 acres that were acquired by the park service in the mid-1990s.

The survey is expected to take several years and could reveal other finds, such as prehistoric artifacts.

The team will use shovel testing, metal detection and other remote-sensing techniques, including ground-penetrating radar, all referenced by a global positioning system unit.

— K.M.



Ocracoke Island: Teachers Explore Unique Culture

By Ann Green ♦ Photos by Michael Halminski

Author and educator Alton Ballance escorts teachers on a tour of Ocracoke Island, population 750.



While leading a group of teachers down a tree-lined back road on the Outer Banks barrier island of Ocracoke, Alton Ballance stops at a special spot that will be forever British.

Leaning over a white picket fence surrounding the British Cemetery, Ballance points to four simple gravestones. Then he recounts his kinfolks' tales of the victims.

"My relatives used to tell stories about hearing torpedoes go off, and the Coast Guard crew bringing in the bodies of these British soldiers," says Ballance, author of *Ocracokers*. "The sailors' bodies were washed up on the beach and buried by locals in simple coffins."

A torpedo from a German submarine killed the soldiers stationed on the trawler *H.M.S. Bedfordshire* on May 7, 1942. The soldiers were guarding the coast from deadly U-boats unleashed by Adolph Hitler.

Continued



Alton Ballance shares stories inside the Ocracoke Lighthouse, a symbol of the island since 1823.



Ocracoke Island is home to historic cemeteries that offer a glimpse of generations past.

Ballance says the influx of soldiers into Ocracoke during World War II gave the Outer Banks village "its first jolt into the modern world."

"The war forever changed Ocracoke," he says, pointing to a Union Jack flag over the tombstones. "It put a new face on it. When I was a boy, there was an old man from Ocean City, Maryland, who visited my grandmother and called her 'Ma.' He had stayed in her home during the war and came back here every summer."

Ballance's war tale is just one piece of

Ocracoke's rich history that he passes on to 23 teachers from across the state. For four days, the Ocracoke native, teacher, author and historian serves as a guide for the "Island People, Island Culture" seminar.

From a trek through a magical maritime forest to a tour of a striking white lighthouse, Ballance relates anecdotes and the colorful heritage of the island to the teachers.

Sponsored by the North Carolina Center for the Advancement of Teaching (NCCAT) in Cullowhee, the seminar is one of many offered by the nonprofit organization — from

storytelling in North Carolina to electric vehicle technology. The seminar, which gives teachers an opportunity to renew their vitality for learning, is open to any North Carolina public school teacher employed for at least three years.

"The program allows teachers to explore new interests and ideas," says North Carolina Sea Grant marine education specialist Lundie Spence. "It treats teachers as professionals and rewards their past efforts. The Ocracoke seminar is a prize on top of a reward."

This is the fifth year of the Ocracoke seminar. "We chose Ocracoke as one site because it is a wonderful place to observe people's values and roots," says NCCAT director Mary Jo Utley. "It is a week of watching and learning about Ocracoke's special culture and its wonderful school."

The seminar begins in the commons area at Ocracoke School that houses students from kindergarten through 12th grade.

Built from white juniper, the room permeates with the sweet smell of cedar. Photos of old fishers peer down from one wall and smiling children from another. A mural of Blackbeard — the famed pirate who dropped anchor near the island — covers most of another wall.

"For this seminar, teachers get to meet people and hear stories about Ocracoke's daily life," says Ballance. "Until you sit at the table and laugh and hear stories from local people, you don't get a full appreciation of the culture."

As a tenth-generation Ocracoker, Ballance relates many personal experiences to the teachers — from carrying a dead body in a station wagon across the sound by ferry to teaching multiple subjects at a unique school.

"When I came back to Ocracoke School in 1982 after teaching in Orange County, I didn't realize how demanding the job would be," he says.

Ballance taught every subject on the high school level except math — including English, journalism, biology, health, physical education and yearbook — and coached the basketball team. Now, he teaches all high school English classes and journalism and

serves as the assistant principal.

He says the small school is "like one big family."

"In an environment where everyone knows everyone else, there is daily interaction among younger kids, older kids, teachers, family members and other people in the community," Ballance writes in his book.

Ferry Boat Captain

Later, Ballance introduces the teachers to Rudy Austin, a tall and burly retired Hatteras ferry captain who now shuttles tourists to nearby Portsmouth Island.

Austin weaves stories about the remoteness of the village that is accessible only by boat, ferry or airplane.

"When I was a boy, they had only one nurse in the community," he says. "I broke my shoulder at 3 o'clock in the afternoon. Since there was no X-ray machine on the island, a guy flew me in a two-seated plane to Buxton and then called the Navy base to take me to Oregon Inlet. From there, the Coast Guard took me through the inlet, and then I went by ambulance to Norfolk. By the time I got to the hospital it was 6 a.m."

Austin has fond memories of belonging to a mounted Boy Scout troop that cared for Ocracoke's wild ponies. "Back then, we did everything on horseback. We even took the horses camping. That changed when the National Park Service took over caring for the horses."

As a resident of the island for more than 58 years, Austin has seen many physical changes to the island.

To find out how much the island has eroded over the last 125 years, he and fisher Gene Ballance spent the last several years developing a series of maps comparing the changes from 1750 to 1999.

As Austin points to the north end on the map, he says, "it has been eroding at a steady rate of 10 feet a year. When I was a boy, the beaches were as flat as the highway. There were no dunes or grasses on the beaches. I used to see sea turtles crawling up and down the main road. When the Park Service planted grass, it did away with the natural replenishment process."



A magical maritime forest is just one of many environmental wonders on Ocracoke.

However, he was surprised to find that the rest of Ocracoke is not washing away.

"The south end isn't eroding," he says. "The north end has been the sacrificial lamb. If we allow the north end to wash away, the rest of the island will also wash away."

The village is on the south end, but Austin also has strong ties to the north end. For many years, he was captain of the Hatteras ferry route. "If the north end goes out, we are ruined."

Ocracoke Minister

To get a glimpse inside a minister's life in a tiny village, the teachers meet Rev. Keith Sikes at the Ocracoke Assembly of God Church — a white-framed building nestled among small cottages.

A tall, outspoken young man, Sikes is the church's 37th minister. While standing in front of the teachers seated in wooden pews, he gives an overview of the church.

"The church is one of the few Assembly of God churches directly linked to the Azusa Street Revival in Los Angeles," the birthplace of the Pentecostal revival movement in the United States.

"The front part of the building was constructed in 1941, and the back was given to the church by the Navy," Sikes says.

"This building has gone through a lot," he says. "It survived the hurricane of 1944 when one member saw the top turned over and taken down the street. The building flipped and touched a power line, which kept the whole building from going over."

Sikes says it's challenging ministering to a congregation of only 24 people.

"The people are unique," he adds. "Since the Methodist minister and I are the only full-time ministers on the island, we are like community chaplains. We pastor everywhere we go. It is hard to even go to the Ocracoke Variety Store without pastoring. You have to leave the island to get away."

At times, Sikes says the island's remoteness is difficult for him, his wife and two young children who are home schooled.

"We have a love-hate relationship with the island," he says. "My children's involvement with other youngsters is limited."

Despite the difficulties of living in a tiny village, Sikes has been touched by the residents' compassion.

"The people are good and family-oriented," he says. "They will quit their jobs to care for an elderly person. Mr. Clinton Gaskill who died recently didn't want to be in a rest home. So the community made up a roster, and people took turns caring for him. This touched me."

After a member dies, Sikes says a local representative takes the body by ferry to a funeral home on Hatteras Island. After the body is embalmed, it is brought back to the island church where the remains are often viewed.

"We usually don't have a service for two to four days after someone dies," says Sikes. "You have to wait for relatives to travel here."

Continued



The island's wild ponies now are cared for by the National Park Service.

For many years, Ballance's father served as the representative of the funeral home and transported bodies in an old gray station wagon across the ferry.

"I have seen my Dad go out all hours of the night," he says. "If the ferry wasn't running, he would sometimes park the station wagon with the body in our back yard."

After visiting the church, Ballance leads the teachers down the street to the Ocracoke lighthouse, the island's most prominent landmark. As the oldest lighthouse in North Carolina and the second oldest in the United States, it has guided mariners along the treacherous coast since 1823.

"The lighthouse is active and runs from dusk to dawn," says Ballance. "It can be seen 13 miles from Ocracoke."

Inside the striking white tower, Ballance shows the five-foot thick brick walls and the steel, spiral staircase that leads to the top. "The top story is not centered. It is offset to allow for the exit of the lightkeeper."

Local Author, Teacher

After a morning of viewing historical sights, Ballance and the teachers eat at a local restaurant. Then they trek down a pristine beach, which overlooks the Atlantic Ocean and is part of the Cape Hatteras National Seashore. Of the 5,535 acres on Ocracoke, only 775 acres in and around the village are outside of the seashore's domain.

An avid naturalist, Ballance seems to know every dune, creek and plant on the beach. As waves crash against the white beach, he points out a dune that was reshaped by the N.C. Department of Transportation.

"The area was pushed down by Hurricane Floyd," he adds. "The wind spread the sand across the highway."

A small and energetic man, Ballance also stops and digs through the sand for mole crabs and then draws a map of the Outer Banks in the sand.

"This area is very alive," he says. "You see mole crabs, and birds flying up and down the beach."

As a first-time visitor to Ocracoke, Murphy teacher Ronda Phillips finds the beach "breathtaking."

"I like Ocracoke because it is so relaxed and laid back," she says. "You can leave behind the pressures of daily life."

Ballance also leads the group across the highway to a maritime forest thriving with huge live oaks. At the beginning of the trail, he explains why an oak tree is shaped like a deer antler.

"This tree is on its last days," he says. "It probably got bent during a hurricane and started growing the wrong way."

As the trail snakes under a mass of trees, Ballance points out a marshy area covered with cattails.

Marshes are some of the most productive areas on earth. "Just offshore is where I used to

go mulleting with two fishermen — Uriah and Sullivan. We would set the net out of a wooden skiff. Sometimes we would come close into shore and chase mullets onto the banks. It was a great adventure back then."

Later, Ballance and the group hike down a path covered with pine straw to a huge live oak bent over like a piece of sculpture.

"If this area was not a national seashore, it would be filled with houses," he says. "Some federal lands are being commercialized. That might be the quest for the future. It depends on the political structure. But I don't think it will happen here."

Island Musician

After a day-long trek around the quaint island, the teachers relax by listening to a local musician at Ocracoke School.

During a buffet dinner prepared by the school's student government association, Martin Garrish, a bearded, middle-aged Ocracoke native, plays a variety of country, old-time and bluegrass tunes on the guitar.

"Music was important to my people," says Garrish. "There was no TV. You would get off work and hear music in the community. I remember hearing the famous vaudeville banjo player Edgar Howard at my grandfather's house."

Garrish, who makes a living as a carpenter, began performing as a youngster in variety shows. Later, he played in a rock'n'roll band and at local bars. Now he performs in the summer at an outdoor stage.

"I am a self-taught musician," he says. "I can't read music."

Many of Garrish's songs are about the Outer Banks. While performing, you notice his distinct Ocracoke dialect or brogue. Some historians claim the dialect has traces of Elizabethan English.

Murphy teacher Phillips was so intrigued by the residents' brogue that she plans to have her gifted students study it.

"Since I live in the mountains where there is also a dialect, the students can compare the two dialects," she says. "I also will probably do something about the history of Ocracoke and am considering hooking up my students as pen pals with Ocracoke students. However, no study

of Ocracoke can convey what I learned from meeting the local people. It is a beautiful place filled with remarkable people who touch your soul."

Phillips hopes the course and correspon-

dence will help her students understand Ocracoke's remoteness.

"We feel isolated in Murphy but not as isolated as Ocracoke," she adds. "They are up against some heavy odds. For example, home

health care is limited there. I spoke to one man whose father needs physical therapy three times a week, but can only get someone to his home once a week. You have to really want to live on Ocracoke to deal with these obstacles." ■

Coast Guard Station Takes New Mission

Since the U.S. Coast Guard vacated the white three-story station overlooking Ocracoke's Silver Lake in 1996, the buildings have been deteriorating.

Now chances look good that the former station will be getting a facelift and new tenants.

The nearly 10,000-square-foot building and garage is likely to be used as a professional development center for North Carolina teachers.

The building will be managed by the North Carolina Center for the Advancement of Teaching (NCCAT) in partnership with East Carolina University's graduate program in maritime studies and other educational groups. NCCAT will use the building for the Ocracoke seminar and other programs.

"This gives us an excellent opportunity to do something special for teachers," says NCCAT director Mary Jo Utley. "We can bring in teachers and introduce them to the Outer Banks. They can have the same excitement about this area as children. It also will be a great opportunity for them to bond with other teachers."

To stabilize the building, the Joint Legislative Commission on Governmental Affairs has appropriated about \$400,000.

"Within the next few months, the stabilization dollars will be used to replace the roof, doors and windows," says Utley.



The U.S. Coast Guard Station, an island landmark, is slated for a facelift and new tenants.

Built in 1942, the Coast Guard station was the base for about 20 members of the Coast Guard stationed at Ocracoke.

"It was a vital part of the community," says Ocracoke teacher and native Alton Ballance.

Ballance has vivid memories of the Coast Guard's rescue efforts. "I have seen a rescue in progress," he says. "The Coast Guard would sometimes go out over 20 miles in 15-foot seas. It was a

model of courage and dedication."

In 1996, the Coast Guard moved most of its operations to Hatteras. However, a small crew still is stationed on the island and conducts rescue efforts. The office is in a trailer near the water tower.

"In Ocracoke, we average between 50 and 60 search cases a year," says Coast Guard Master Chief Boatswain's Mate Michael Leavitt. "We handle anything that has to do with recreational activities on the water — from kayaks missing to diving and boating accidents."

The Coast Guard still has a boat tied up to the pier overlooking the old station. The pier is part of the more than eight-acre site.

"Because of its location, the Coast Guard station and its grounds are valuable real estate, which makes it all the more important to be maintained as a public-use facility and not for commercial purposes," says Ballance. ■

—A.G.



A Ferry Tale for All Seasons

By Pam Smith

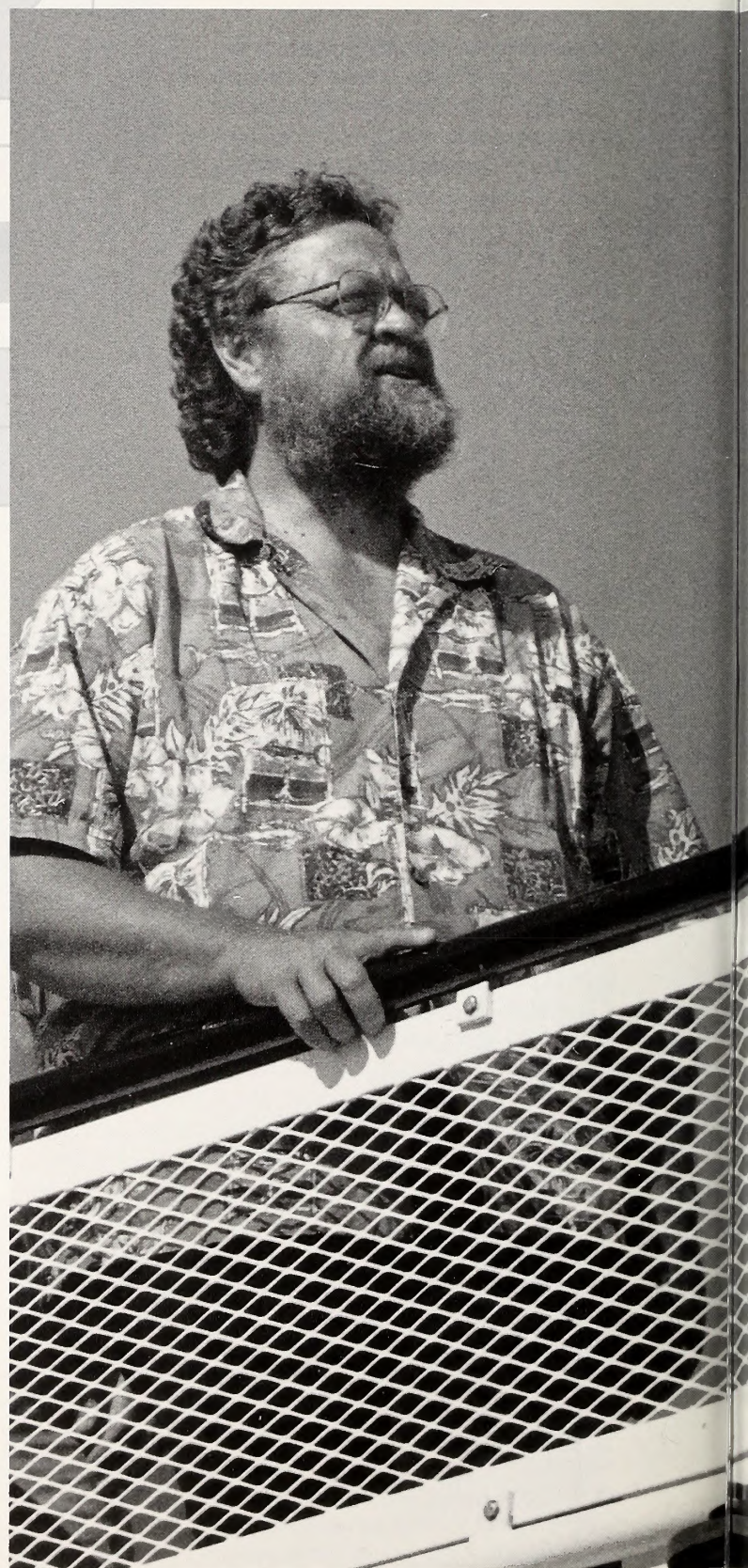
Two blasts from the ship's horn and *The Carteret* slips away from the Cedar Island ferry dock to begin the two-and-a-quarter hour Pamlico Sound crossing. Destination: Ocracoke Island.

Moments before, families with kids, cats and dogs, hopeful fishing parties, Outer Banks residents returning from mainland business, and local commuters heading to

their island jobs queued up for the trip. They'd come on motorcycles and bicycles, in cars, motor homes, and trucks pulling boats loaded with fishing gear — license plates from as far away as Canada and Kansas attesting to the lure of North Carolina's coast.

Now on board *The Carteret*, passengers settle in to enjoy the excursion across the mirror-like sound under a cloudless blue sky. Some, new at the ferry game, cautiously step outside their vehicles. Two veterans pull deck chairs from the trunk and arrange them on the windy deck.

C o n t i n u e d



Scott D. Taylor

G.W. "Jerry" Gaskill (second from right), director of the N.C. Ferry Division, joins Sea Grant researchers Larry Crowder, Joe Ramus and Hans Paerl aboard a Cherry Branch-Minnesott Beach ferry — the first of three routes slated for the "Ferrymon" water-monitoring project.





The Herbert C. Bonner backs up sister ferries The Neuse and The Lupton to move 1,800 passengers on 72 daily crossings of the Cherry Branch-Minnesott Beach route.

Pam Smith



Captain Sandy Mitchell, Southport skipper, has helped with rescue missions on the Cape Fear River.

Pam Smith



Southport Mate Mary Beth Ray welcomes passengers on board.

Another stretches across the front seat of her SUV with a pillow tucked behind her head and a paperback novel in hand — windows open to catch the steady breeze. Plants and shrubs for a seaside landscape are crowded in the rear compartment.

As we clear the dock, a young man pulls bread from a picnic basket. Greedy sea gulls swoop down to claim their prize from his upheld hand. Soon the gulls lose interest in the bread and return to the shore, now shrinking on the horizon.

It will be a while before the Ocracoke lighthouse comes into view, so there is plenty of time to walk about the ferry, chat with passengers, and simply enjoy the moving images of sea and shore.

Born of geographic necessity

There also is time to think about the evolution of the N. C. Department of Transportation's Ferry Division into one of the largest state-owned and -operated systems in the nation — second only to Washington.

Today, a fleet of 24 ferries operates year-round to transport more than two million passengers across seven water routes over five bodies of water. In addition, the division owns a dredge and numerous support vessels, maintains its docks and passenger service centers, and operates its own shipyard.

Born of geographic necessity, the state's sophisticated ferry system provides much more than a pleasant way for tourists to "discover" coastal North Carolina. Ferries are an integral part of coastal culture and history, and continue to be the lifeline of many communities in the region.

It is not hard to imagine Native Americans negotiating the complex system of rivers, bays, sounds and inlets in dug-out canoes towing rafts piled with freshly killed wildlife for their village's winter cache.

Early settlers, too, depended on small watercraft and barges to ferry people and essential goods to towns scattered along miles of erratic coast line. No bridges connected the string of Outer Banks islands with each other or the mainland, and few overland roads traversed the low-lying terrain.

As the coastal population grew, so did the need for food, medicine, trade goods and mail — as well as for a reliable means of communication with the world beyond watery boundaries. In the early 1900s, a ferry system began to take shape from private efforts to meet those needs. A tug and barge conveyance system linked Bodie Island and Hatteras Island across the Oregon Inlet. A wooden trawler-type ferry soon was put on line.

The groundwork was laid for a state-supported ferry system when, in 1934, the State Highway Commission — now known as the Department of Transportation — subsidized the route to reduce the ferry tolls. By 1942, a fixed reimbursement arrangement with the ferry operator eliminated tolls on that route.

Similarly, in the early 1940s, a private ferry business across the Croatan Sound from Manns Harbor to Manteo was established. When the captain-owner died, his family sold the franchise and two vessels, the *Dare* and *Tyrrell*, to the state in 1946.

The ferry system grew in concert with other coastal developments in the early 1950s, which included paving N.C. 12 from Whalebone Junction to Hatteras and establishing the Cape Hatteras National Seashore. Larger capacity vessels and additional routes were launched to meet demands.

With expansion came the decision by the State Highway Commission in 1960 to create an independent State Ferry Operations office at Manteo. To provide more centralized service, its headquarters were moved to Morehead City in 1964. In 1974, it became known as the N.C. Ferry Division.

Responding to life and death emergencies

Ferry routes and vessel sizes have changed to meet transportation needs, says G.W. "Jerry" Gaskill, division director since 1993. Long before he came on board as director, Gaskill, whose family roots sink deep into Cedar Island and Ocracoke shores, understood that the ferry system plays a vital role in the day-to-day lives of coastal residents.

Gaskill also knows too well that the system plays a part in life-and-death emergencies such as Hurricane Floyd in September 1999.

State evacuation operations were hampered when a section of U.S. 17 between Chocowinity and Washington flooded, he recalls. Coordinating with the state's emergency management team, Gaskill quickly moved four extra vessels into place on the Pamlico River at the Aurora-Bayview ferry crossing. For three days, state troopers diverted traffic from the flooded highway to Aurora. Thanks to round-the-clock ferry operations, some 8,600 vehicles filled with 14,000 anxious passengers moved to safer and dryer U.S. 264 on the Bayview side.

There were tense moments, recalls Captain Charles Piner. "It was the only way to get to the hospitals in Greenville where one family had a dying grandmother. The highway patrol allowed the family car to pass ahead in the line of waiting vehicles so that they could get there for their good-byes. Another woman in labor managed to make it to the hospital in time," he adds.

Piner, a former tugboat captain, has been with the ferry division since 1996 — long enough to remember hurricanes Fran and Bertha. "Nothing has been as dramatic as Floyd's flooding," he attests.

That may be true, Gaskill says, but the ferry workers historically are the "unsung heroes" of coastal storms — assisting in evacuation efforts from Outer Banks communities, delivering food and medicine to stranded islanders, and unglamorously transporting refuse in the wake of such natural disasters. Ferries also completed the Outer Banks link while the Bonner Bridge at Oregon Inlet was closed for repairs after being damaged by a barge during a nor'easter in October 1990.

All emergencies don't have happy endings, says Captain Sandy Mitchell on board the *Southport*. The former Navy and merchant seaman says his crew was called into action to help with the rescue of a capsized shrimp boat on the Cape Fear near the former Corncake Inlet. "We rescued the passenger on the boat, but the captain didn't make it," says a somber Mitchell.

Continued

Unexpected weather situations can cause any body of water to go from flat to four-foot waves in a half-hour's time, Mitchell notes. But the *Southport's* advantage is a state-of-the-art Voith-Schneider propulsion system. An unconventional rudder and prop in one, its five blades can be varied in pitch, thrust and direction to enhance maneuverability even in the roughest conditions.

"We can keep running in wind when others have had to tie up at the dock," Mitchell says.

The Southport-Fort Fisher route gives passengers another advantage — a view of the ruins of the Price Creek Light. Built in 1850, it is all that is left of a series of range lights used to guide ships along a Cape Fear River channel to the Wilmington port. During the Civil War, the lights were critical to Confederate blockade runners, but were destroyed when the Union troops took control of the coast.

Less dramatic, but important

Not all ferry routes have dramatic tales to tell, Gaskill points out. Each meets a particular need. The Minnesott Beach-Cherry Branch run serves a predominantly military population at the Cherry Point Air Station with two ferries making 72 daily crossings; the Aurora-Bayview ferry transports PCS Phosphate mine workers; and the Swan Quarter-Ocracoke ferry connects island residents to their Hyde County seat.

The Knotts Island to Currituck ferry was initiated in 1962 to provide transportation across Currituck Sound for youngsters attending county schools on the mainland. A 90-minute bus route formerly took the students to school via Virginia Beach and Chesapeake, Va. Now, middle and high school buses sail across the sound in half the time.

"Some of our classmates from the county think it must be exciting to ride a ferry to school," says Jennifer Hicks, a student at Currituck Middle School. "But, for us, it's kind of routine — except when we have rough weather."

Her brother, Jeremy Gruzd, says that not much stops the ferry from delivering

students to and from school. "Fog is just about the only thing that prevents it from going. In case of fog, the buses go the long route through Virginia," he points out.

Otherwise, Knotts Island middle and high school students board buses in their neighborhoods and roll on the deck of the *James Baxter Hunt, Jr.* in time for a 7 a.m. departure.

Captain Gilbert J. Brickhouse recalls that the *Hunt* was put into service on the Currituck Sound in 1985 to replace the six-car *Knotts Island*. The growing Knotts Island population soon outpaced the capacity of the *Hunt*. In 1999, the *Hunt* was transferred to the Manns Harbor shipyard, cut in half, and 30 feet added to its middle. The overhaul doubled the ferry's capacity — and saved the state millions of dollars in new ferry costs.

Brickhouse joined the ferry service in 1976 and has had his captain's license for 15 years. He can't imagine a better job, in spite of the inherent dangers — water spouts, lightening storms and smoke from burning marshes.

"It can get pretty exciting," Brickhouse says. "But nothing is more exciting than knowing that you are in a place to help kids. Some come on board in the morning with a frown on their faces. If you can send them off with a smile, who knows, maybe they'll make a good grade that day and feel a lot better about themselves."

Ferries becoming science labs

As far as Gaskill is concerned, there are no limits to how the ferry division can serve North Carolinians. Ferries already offer unique views of lighthouses, access to remote communities, emergency evacuation assistance, and dredging operations to keep shipping channels open.

Soon select ferries will become research vessels thanks to a partnership with Sea Grant scientists from the Duke University Marine Lab, the UNC-Chapel Hill Institute for Marine Sciences, and the N.C. Department of Environment and Natural Resources (DENR). "Ferrymon" project leaders are Joseph Ramus, Duke

professor of biological oceanography, and Hans Paerl, UNC Kenan professor of marine and environmental science.

Ramus says Ferrymon will use automated devices to monitor salinity, temperature, turbidity, chlorophyll and oxygen levels. The ferries also will collect refrigerated water samples to measure nutrients and other dissolved materials.

The monitoring devices will sample natural water flowing into the sea chests on the Cherry Branch-Minnesott Beach ferry on the Neuse River, and on the Cedar Island-Ocracoke route and the Swan Quarter-Ocracoke route, both on the Pamlico Sound.

Coupled with other remote monitoring programs, Ramus says, the scientists hope to get a better sense of how the Pamlico — the most important fishery nursery in the mid-Atlantic — works.

"Ultimately, we will be able to construct predictive models, so that when there is an increase in nutrient input, we will know what the outcome will be," Ramus says. "This partnership makes sense. Ferries are large stable platforms that can be utilized for efficient water-quality monitoring."

Larry Ausley, ecosystems unit supervisor for DENR's Division of Water Quality, says the short-term monitoring results will be of particular interest because of the nutrient loading from last year's hurricane season. Scientists will watch closely to see what happens when the Pamlico waters are warmed by the summer's heat.

Ausley believes the partnership with the ferry division will be a cost-effective way to conduct ongoing analysis of the surface waters of this large and important body of water in real time. Eventually, Ferrymon data will be available to the public on a Web site.

The Ferrymon Project may cause Gaskill to rethink a Ferry Division promotional message that suggests "Looking for Discovery, Adventure and History? Call 1-800-By Ferry." Perhaps it should say "N.C. Ferries: Looking for Scientific Discovery. Making History." ■

For a closer look at ferry schedules, go to www.dot.state.nc.us/transit/ferry on the Internet.

H.L. Powell



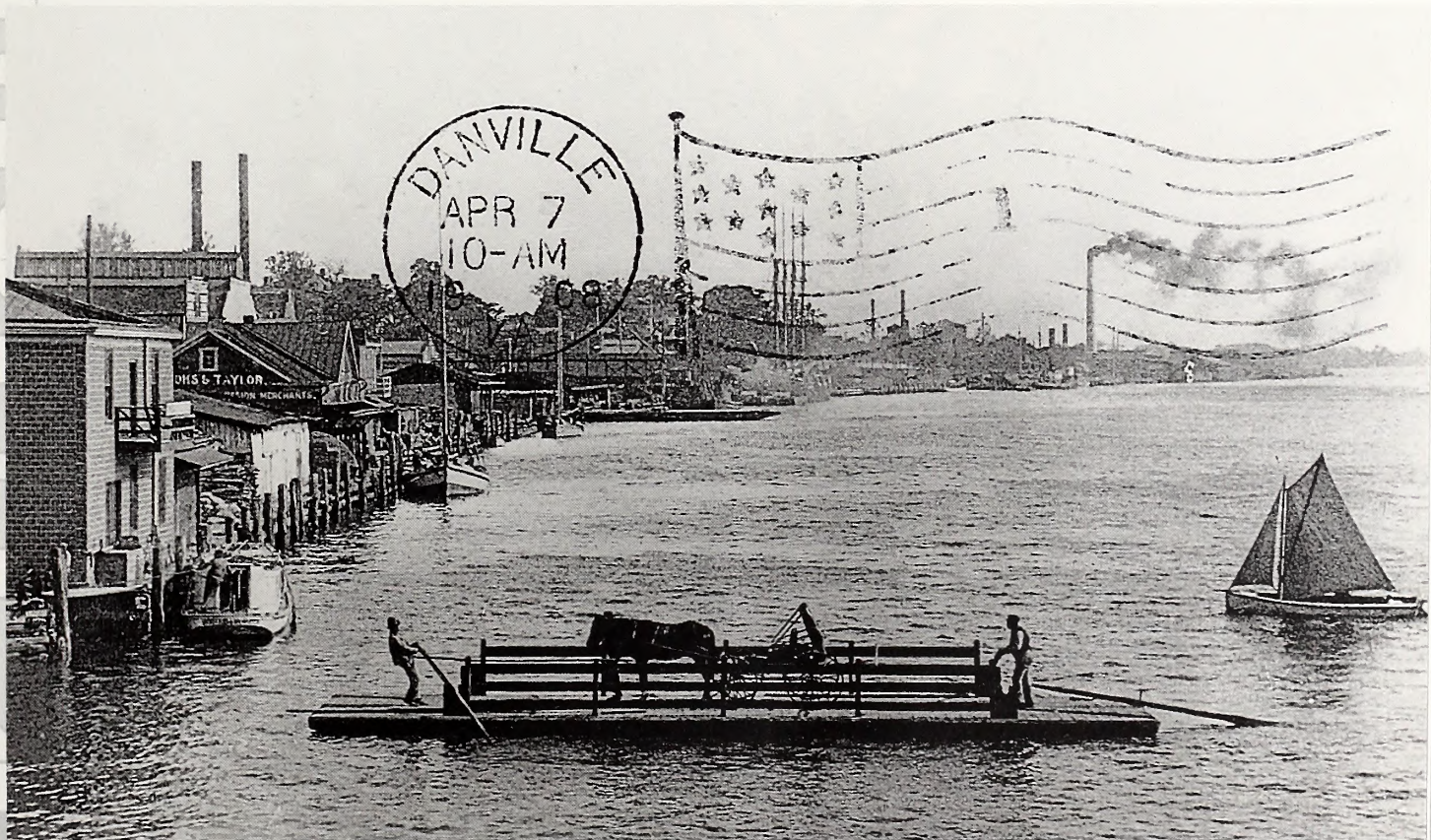
The old Knotts Island Ferry was replaced to keep pace with growing demand.

Pam Smith



Knotts Island siblings, Jeremy Gruz and Jennifer Hicks, say riding the ferry to Currituck County schools is pretty routine.

N.C. Division of Archives & History



Ferries have played a major role in the economic development of coastal North Carolina, as seen in the postcard of Wilmington, circa 1908.

A black and white photograph of a dolphin leaping from the water. The dolphin's body is curved in mid-air, with its tail visible at the bottom left. The background shows a body of water with some whitecaps and a cloudy sky. The title 'DOLPHIN WATCHING' is overlaid diagonally across the center of the image in a bold, sans-serif font.

DOLPHIN WATCHING



TOURISTS' TRIPS CAN PROVIDE RESEARCH DATA

By Ann Green

While

Captain Stuart Wescott was leading a wild dolphin safari through Roanoke Sound, he saw two bottlenose dolphins jump out of the water and make a "perfect valentine."

"The two dolphins were getting away from the males," says Wescott, the owner of A & A Outer Banks Cruises in Manteo. "It is always wonderful seeing these delightful animals in the wild. Every time, I go out I 'ooh' and 'ah' over the dolphins."

Continued



Scott D. Taylor

“Ecotourism is the fastest-growing sector of tourism worldwide. Along the North Carolina coast the demand for wildlife-related activities such as birding, marine mammal observation and kayak ecotours is rapidly increasing. As businesses catering to visitors increase, we need to know more about how these people are impacting the natural and economic environments and the quality of life for local residents.”
— North Carolina Sea Grant Survey

Wescott isn't the only one marveling over the dolphins' playful activities — from riding on waves to flipping fish on their noses. Each summer, Wescott and other Outer Banks tour operators take hundreds of visitors on cruises around Roanoke Island, the Pamlico Sound, Oregon, Hatteras and Ocracoke inlets and the Atlantic in search of bottlenose dolphins, which also are found on the southern end of North Carolina's coast.

In fact, dolphin watching has become such a popular activity that some tour operators stay booked up during the season when bottlenose dolphins travel into the protected inshore waters of North Carolina's barrier islands.

“We run three trips a day from May to September,” says Captain Rich Mallon-Day, who operates the Nags Head Dolphin Watch out of Willet's Wetsports on the Nags Head/Manteo Causeway. “Every week, we are usually booked for the entire week.”

Mallon-Day delights in seeing the moms with their new calves. “It's fun seeing the families changing.”

Jack Thigpen, North Carolina Sea Grant acting extension director and coastal recreation and tourism specialist, attributes the growth of bottlenose dolphin watching to increased interest in the marine environment.

“A generation grew up watching the adventure series ‘Flipper’ in the 1960s,” says Thigpen. “Now people want to find out more about dolphin behavior, biology and their habitat.”

To better understand nature tourists' interest in North Carolina and the impact of commercial dolphin-watch enterprises on the Outer Banks, Thigpen and North Carolina Sea Grant staff member Ann Pierce conducted a 1999 survey of Outer Banks dolphin watchers. They worked with Mallon-Day, Wescott, Spurgeon Stowe, captain of *Ms. Hatteras*, and Stevie Wilson, captain of *Miss Ocracoke*.

“Ecotourism is the fastest-growing

sector of tourism worldwide," according to the survey report. "Along the North Carolina coast the demand for wildlife-related activities such as birding, marine mammal observation and kayak ecotours is rapidly increasing. As businesses catering to visitors increase, we need to know more about how these people are impacting the natural and economic environments and the quality of life for local residents."

The survey focused on watchers of bottlenose dolphins, *Tursiops truncatus*. It's the most commonly observed cetacean in the wild because of its inshore range — and in the world because of its history in oceanariums and adaptability to life in captivity.

"Though well-studied as a species, we know very little about the range, association patterns, overall population structure and number of bottlenose dolphins ranging along North America's East Coast," says Pierce.

"Dolphin watching can provide an

educational, low-impact activity for visitors and potentially serve as a platform to facilitate much-needed research on dolphins in inshore and nearshore waters of the western Atlantic," she adds.

One important survey result was that more than half of the participants were interested in learning more about the marine environment. However, 80.3 percent knew little or nothing about the Marine Mammal Protection Act (MMPA).

Passed in 1972, the MMPA provides strong legal protection for polar bears, sea otters, walruses, dugongs, whales, porpoises, sea lions and various species of dolphins. The act also prohibits people from feeding, touching or swimming with wild dolphins. The maximum fine for violating the MMPA is \$20,000 and one year in jail.

The survey also found that dolphin watchers participate in a variety of activities — from touring historical sites to beachcombing.

"This is good news for the tourism economy," says Thigpen. "People are here to spend money as well as learn about the coastal environment. Nearly two-thirds of the participants had annual family incomes over \$50,000."

Although whale watching began in the 1970s on the West Coast as an activity for adventure travelers, dolphin watching is a relatively new commercial enterprise.

"Whale watching is a prime example of a nature-based business that has engendered public support for marine conservation, helped protect endangered species and provided vital support for marine mammal research," says Pierce.

"Because of broad public support for research and protection of the gray whales, the number of whales increased. These whales were eventually removed from the endangered species list."

C o n t i n u e d

"Dolphin watching can provide an educational, low-impact activity for visitors and potentially serve as a platform to facilitate much-needed research on dolphins in inshore and nearshore waters of the western Atlantic."

— Ann Pierce, North Carolina Sea Grant

Jack Thigpen





Nags Head Dolphin Watch

Some dolphins have distinctive dorsal fins recognizable by shape, color or permanent notches and nicks.

Dolphin Stranding

Interest in dolphins increased in the late 1980s after more than 740 bottlenose dolphins that died from a morbillivirus — which is similar to canine distemper in dogs and weakens the dolphin's immune system — were stranded on Atlantic beaches. The 1987 stranding became a catalyst for gathering data about the species. Scientists realized that very little was known about the population size and migration patterns of this species in the western Atlantic.

Because of the insufficient data on bottlenose dolphins and lack of funding for population studies, independent researchers on the East Coast, including Mallon-Day, joined forces in 1993 to form the Atlantic Dolphin Research Cooperative.

However, no group was collecting data on the large number of bottlenose dolphins passing through the Outer Banks waters.

Mallon-Day and his wife, Kate, filled an important niche in 1997 by forming the Nags Head Dolphin Watch, which supports research by collecting photos of individual dolphins. Some dolphins have distinctive dorsal fins recognizable by shape, color or permanent notches and nicks.

The tours teach people about dolphins while conducting the studies, says Mallon-Day. "The research is paid for by people on the tours."

The Mallon-Days' collaboration with researchers at the N.C. Maritime Museum, Virginia Marine Science Museum, the Duke University Marine Lab and the University of North Carolina at Wilmington contributes to a computerized dolphin catalogue, maintained by the National Oceanic and Atmospheric Administration's Beaufort laboratory.

Since 1997, the Mallon-Days have catalogued about 300 dolphins that have been given nicknames such as "Fatlip," "White Dot," "Cruella" and "Onion."

"Onion is the most famous," says Mallon-Day. "He was the first dolphin identified in both his summer (Nags Head) and winter (Beaufort) residence. He is easy to identify because of a propeller-mangled fin."

Through research efforts, the Mallon-Days and scientists are trying to get a more accurate count of bottlenose dolphins on the East Coast.

"Some research shows that over one-half of dolphins died off in 1987," says Mallon-Day. "We think the study is inaccurate."

This summer, additional dolphin research, led by Bill Foster of Hatteras, will be funded by the N.C. Fishery Resource Grant program.

Some dolphin watchers discover a new dolphin. Others just marvel at the pink on a dolphin's belly, Wescott says.

"It is like a blush on the face of a well child," says Wescott. ■

Dolphin Data

Bottlenose dolphins have long fascinated human beings with their playful behavior.

The coastal bottlenose dolphin, or *Tursiops truncatus*, is found worldwide in tropical to cold-temperate waters. It is primarily found in the Gulf of Mexico, year-round south of Cape Hatteras and further north in the summer, including Outer Banks sounds.

Other special characteristics of the coastal bottlenose dolphin compiled from Rhode Island Sea Grant's *Guide to Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico* are:

Size: Adult sizes vary considerably, from 6 to 12 feet. At birth approximately 3 feet.

Body: Robust body and head. Short, thick well-defined beak. Flippers pointed, flukes deeply notched

Color: Highly variable: blue-gray to brown with lighter sides and belly. Some have spots, pale shoulder blaze, or cap

Dorsal Fin: Tall, falcate, with broad base; located mid-back.

Behavior: Acrobatic: breach, spyhop, lobtail.

Habitat: Shallow, warm, inshore waters of bays and rivers.

Diet: Variety of fish and invertebrates.

Life History: Females sexually mature at 5 to 10 years, males at 8 to 12 years. Breed in spring and fall.

The Sea Grant guides are available for \$25. To order, call 401/874-6842 or fax: 401/874-6817.

— A.G.

Charles Kuralt Trail

Exploring Sites and Sounds

By Pam Smith

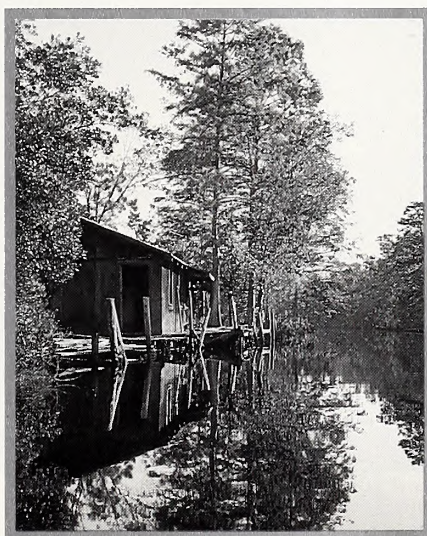
For years, the late Charles Kuralt introduced millions of viewers to magnificent sights and sounds of our National Wildlife Refuges in what became the trademark closing segment of his "Sunday Morning" program on CBS television.

To recognize the North Carolina native's dedication to sharing these living treasures, the U.S. Fish & Wildlife Service has established the Charles Kuralt Trail, linking a dozen sites in the mid-Atlantic coastal plain of North Carolina and Virginia. The 11 national wildlife refuges and one national fish hatchery on the trail are within the Roanoke-Tar-Neuse-Cape Fear Ecosystem, underscoring the service's ecosystem approach to wildlife management.

"This meeting of the rivers and the sea creates an incredibly productive and important place for fish and wildlife," says Bonnie W. Strawser, wildlife interpretive specialist at the Alligator River and Pea Island National Wildlife refuges. The public can explore some of the wildest lands in the mid-Atlantic all year long, she says.

The Charles Kuralt Trail was conceived by Marvin Cook, proprietor of Wilderness Graphics, Inc., of Tallahassee, Fla. Cook was recognized as a "refuge hero" by the U.S. Fish & Wildlife Service the same year Kuralt was honored posthumously.

"He (Cook) wanted to do something lasting, that would reflect Charles' effort to get the public to recognize the value of our natural heritage," Strawser says.



Scott D. Taylor

Cook's "awesome idea" received support from federal officials, the Coastal Wildlife Refuge Society and the Kuralt family. By October 1999, nine of the 12 sites were dedicated; the detailed brochure "On the Refuge Road: Charles Kuralt Trail" was distributed; and an audio tour (cassette tape and compact disk) was recorded for purchase. Wallace Kuralt of Chapel Hill, brother of the late journalist, narrates the tour and introduces experts who talk about the unique features of each site.

The beauty of the Charles Kuralt Trail, Strawser adds, is that visitors are not locked in to a set route. They may plan travels according to time, interest and season. And, it's all free and open to the public 365 days a year — 366 this year.

At each site, visitors will find a red-roofed kiosk with information about the special attractions. Designated stops on the Charles Kuralt Trail include:

IN VIRGINIA

- Back Bay National Wildlife Refuge, Virginia Beach
- The Great Dismal Swamp National Wildlife Refuge, Suffolk

IN NORTH CAROLINA

- Mackay Island National Wildlife Refuge, Knotts Island
- Alligator River National Wildlife Refuge, Manteo
- Edenton National Fish Hatchery, Edenton
- Roanoke River National Wildlife Refuge, Windsor
- Pocosin Lakes National Wildlife Refuge, Creswell
- Pea Island National Wildlife Refuge, Hatteras Island
- Mattamuskeet National Wildlife Refuge, Hyde County
- Sites are being developed at Swan Quarter, Cedar Island and Currituck refuges

The cost of the CD is \$10, the tape is \$6, including tax and shipping. The brochures, which feature a map and description of each site, are free. Contact Bonnie W. Strawser, Pea Island/Alligator River NWR, P.O. Box 1969, Manteo, N.C. 27954, or call 252/473-1131, ext. 19. On the web, check www.outerbanks.com. □

The Red Drum:

First in Fish for North Carolina Recreational Anglers

By Pam Smith

Mention red drum to Jim Bahen and you are certain to transport him to that mystical place of all recreational anglers: the record book.

Bahen, Sea Grant recreational fishing extension specialist, would love to be the one who breaks the record set in 1984 when a 59-inch, 94.2 pounder was snagged off Hatteras.

In those days, the angler could haul the fish to shore and proudly pose for the traditional trophy picture. Bahen knows the "big ones" are out there. After all, the red drum — the state's designated saltwater fish — is believed to live up to 60 years or more.

But to protect dwindling stocks, today's regulations limit recreational anglers to keeping one 18- to 27-inch red drum on any single day. Bahen hopes someone will be there to document the moment he lands his dream fish before he

returns it to the water, and it becomes a legendary "one that got away."

Not that Bahen is complaining. He is a staunch advocate of catch-and-release techniques for recreational fishers. He also sits on an N.C. Marine Fisheries Commission (MFC) advisory panel that is developing a red drum fishery management plan. The idea, after all, is to protect the species during its spawning years and, in time, boost the numbers. More about that later.

First, let's consider facts about the red drum — also known as channel bass, puppy drum, or redfish.

Named the state saltwater fish in 1971, red drum, not surprisingly, get their name from their color. What's more, during spawning, males produce a drum-like noise by vibrating a muscle in their swim bladder. Its scientific name, *Scianops ocellatus*, means perch-like marine fish

(Greek) with eye-like colored spot or spots (Latin). Red drum bear black spots, on each side near the base of their tails. These fool predators into attacking the tails, not the eyes — buying escape time for the fish.

According to the N.C. Division of Marine Fisheries (DMF), red drum live in coastal and estuarine waters from Massachusetts to Mexico. Bottom feeders, they prefer crabs, shrimp, menhaden, mullet and spot. Reaching sexual maturity during their fourth year, when they are about 30 to 37 inches long, they spawn in the near-shore ocean waters around tidal inlets in late summer to early fall. Their eggs hatch and are carried into the sounds and estuaries by the tides and winds.

The red drum depend on estuaries during the early stages of their life cycle, seeking quiet shallow water with grassy or muddy bottoms. They remain in the sounds

Scott D. Taylor



Jim Bahen demonstrates the proper way to handle and release a catch.

Illustration by Duane Rorer



and estuaries or in the surf zones along inlets for the first three or four years of their lives.

To understand more about the red drum life history, Sea Grant researcher Peter Rand is studying its spawning habitat. Rand hopes to document the salinity range that best supports egg and larvae survival.

STOCK STATUS AND REMEDIES

The DMF lists the red drum as "stressed-declining" because of stock status reports of a dramatic decline in the number of red drum reaching maturity. The division began tagging red drum in 1983 to determine seasonal occurrence, migration and growth. Between 1991 and 1993, only 1 percent of the 9,000 juvenile tagged were recaptured as spawning-sized adults. "Spawning potential ratio" is used to determine the health of a fish stock. The ratio for a healthy population is 40 percent. But for

the North Carolina red drum, the ratio is less than 10 percent.

As part of the Fisheries Reform Act of 1997, fishery commissioners began to appoint advisory councils to help develop management plans for each of the state's commercially and recreationally important marine fisheries species, including the red drum. These plans will form the basis for future regulations for species, species groups, fishing gear and geographic areas.

Bahen says the work of the red drum advisory committee is nearly complete. In October, the MFC will act on advisory committee recommendations and public comments.

Meanwhile, anglers are sticking to interim measures — size and harvest limits — to help restore stocks of the popular red drum fish. While no recreational salt water license is required in North Carolina, Bahen

stresses that individuals are obliged to learn and abide by rules for each fishery. "It's a matter of ethics," he says.

YEAR-ROUND FUN IN THE FIGHT

Bahen asserts that anyone who ever has fished for red drum knows the fun is in the fight, no matter how you measure the landing. Open for harvest year-round, red drum puts the skills of fishing veterans to the test. "You'll know when you have a red drum on the line. The red drum is a fighter and will give you a run for your money," Bahen attests.

The beauty of the red drum is that you can put your line down in virtually any kind of coastal water in North Carolina — from estuarine rivers and streams to open sound, inlets, surf and creek banks.

"You can sight-cast red drum. They show themselves," Bahen explains. "At high tide, they'll go into the marsh and root around. You may see the movement of the grass. The sight of the dorsal fin just above the water's surface is a clear signal of feeding red drum — an invitation to drop your line."

Surf fishers should look for the red drum's golden red glistening through breaking waves or in fast-moving inlet waters. They'll need to select gear to match larger fish usually found at these sites. Bahen suggests using rods from 7 to 10 feet, or longer, and 10- to 15-pound test line to accommodate the size of the fish and the churning water.

As for bait, red drum don't seem to be picky eaters. Though they prefer natural bait, such as cut mullet, they will bite on artificial lures or top water bait. Red drum are becoming a popular target for light tackle fly fishing enthusiasts, he notes.

Bahen prefers to use the circle hook and natural bait in his catch-and-release, recreational fishing pursuits. "All the research indicates that the circle hook reduces fish mortality because it catches the fish in the corner of its mouth. It is rare to see a gut-hooked fish."

To minimize damage to the fish, don't jerk the line to set the hook, he says. The circle hook is designed to slide into the corner of the fish's mouth as the fish takes the bait and begins to swim away. Once the fish is reeled in, hold the fish gently at the water surface to remove the hook. "Take time to admire your catch as you examine it for gill damage before releasing him," Bahen urges.

If it is difficult to remove the hook, Bahen says, release the fish, hook and all. Most circle hooks are made of steel that will break down and fall away from the fish in time.

Circle hooks were introduced in North Carolina as part of a bluefin tuna catch-and-release program several years ago. They are catching on for use with different fish species to increase fish survival and help bolster stocks.

Meanwhile, polling along Howell's Creek near Wilmington, the pressure is on for Bahen to catch a red drum model for the *Coastwatch* article. Conditions are not the best. An overnight rain has made it difficult to spot fish through the murky, mud-stirred creek. A small flounder takes the bait quickly. Bahen releases it for another time.

A couple of hours pass and Bahen and local guide, Tyler Stone, are about to give up. Photographer Scott Taylor encourages one more try. A small red drum obliges, and Bahen plays his catch long enough to enjoy the encounter. Then, Bahen reels in the fish to demonstrate proper handling and releasing techniques.

A good size red drum for dinner for three is about 21 inches. Baked, broiled or blackened, it ranks up there with speckled trout or spot, Bahen says.

But the perfect size red drum, according to Bahen's calculations? That would be a record-breaking 95 pounds. ■

The red drum is not a commercially targeted fish, but may be taken as by-catch. However, there is a 100-pound daily trip limit for commercial fishing vessels.



The Purvis slave cabin in Greene County is one of the last surviving slave cabins in North Carolina.

The Book of Nature

By David Cecelski • Photos courtesy of North Carolina Museum of History

In 1895, a popcorn peddler named Allen Parker told the story of his life as a slave on the North Carolina coast. Parker published only a few copies of *Recollections of Slavery Times* for his friends and family in Worcester, Mass., where he lived after the Civil War. The slim, 97-page book quickly faded into obscurity, unknown even to the leading scholars on American slave narratives.

Then, two or three years ago, I stumbled upon a copy of this priceless lost memoir at the Illinois State Historical Library in Springfield, Ill. How the book ended up in Illinois remains a mystery. But that manuscript turned out to be the only surviving copy of Parker's *Recollections* in any library or archive in the United States.

I do not know if I can put into words

the excitement, almost the sheer joy, that a historian feels at discovering a document like Parker's *Recollections*. I find these discoveries just as exhilarating as paddling into a swamp wilderness or exploring a remote barrier island after a big storm. A whole new world opens up before you — you never know what wonders and surprises will be revealed in that uncharted territory.

For me, this may be especially true of a slave narrative like Parker's *Recollections*. As I travel along the coast, I rarely find any trace of its slave past. Though African American slaves once made up a majority of the population in many tidewater towns and counties, they are virtually invisible in the historic sites, museums, monuments, and markers that portray coastal life before

1865. When Parker decried the fate of his mother, he described that of all slaves who lived and died in coastal North Carolina. In his words, she "now lies buried in an unmarked and neglected grave."

The scarcity of firsthand accounts of slavery is one important stumbling block to studying slave life. Slaves could not legally be taught to read and write, so they left few written records. To piece together their lives, historians rely almost entirely on accounts left by their masters. The result has been both a planter-centered view of slave life and a fragmented portrait of the antebellum past in general.

To appreciate the importance of a newly discovered slave narrative like Parker's *Recollections*, we only have to

remember that merely a half-dozen other slave writings are known to have arisen from tidewater North Carolina. Between 1843 and 1852, Harriet Jacobs of Edenton, Moses Grandy of Camden County, and Thomas H. Jones of Wilmington published autobiographies after escaping from the South. *Incidents in the Life of a Slave Girl*, Jacobs' narrative, has been belatedly recognized as a classic of American literature.

In addition, William H. Robinson of Wilmington, William Ferebee (once a Currituck slave waterman), and William Henry Singleton (a slave at Garbacon Creek in what is now Carteret County, then part of Craven County) all published memoirs after the Civil War. Except for Jacobs' *Incidents* and Singleton's *Recollections of My Slavery Days*, these slave narratives can be found only in the largest university libraries and are not readily available to the general public.

Parker provides insight into tidewater life — and not just slave life — that cannot be found anywhere else. Parker worked for a great variety of small planters and yeoman farmers, including the poor sort of backwoods farmer who barely scratched out a living on the edge of the Great Dismal Swamp. This is a part of Albemarle society long overshadowed by the great planters and wealthy merchants, whose family records we have inherited and whose homes are preserved in historic districts. Parker's memoir cuts through that thin upper crust of Albemarle society and lets us see into the heart of daily life for black and white, slave and free.

Allen Parker's story begins in Chowan County over a century and a half ago. Born about 1840, he was the son of slaves Millie Parker and Jeff Ellick. He lived on a modest plantation owned by Peter Parker in the Chowan community, a rural neighborhood located eight miles north of Edenton (then the largest seaport on Albemarle Sound) and bordered by Bear Swamp, the Great Dismal Swamp, and two blackwater rivers, the Chowan and the Yeopim. "The

country around Chowan was not very thickly settled," Parker wrote in *Recollections*, "the land being divided up into farms or plantations, upon which was raised wheat, indian corn, rye, oats, peanuts, sweet-potatoes and sometimes rice."

Peter Parker died when Allen was a baby. He left the slave boy and his mother to his infant daughter, Annie, with the stipulation that Millie and Allen should be "hired out" by her guardian until she was an adult. The guardian auctioned off the slaves to other individuals for a year at a time. The hirers got the slaves' labor; Peter Parker's estate got the proceeds; Millie and Allen were supposed to get food and clothing. Like many slaves in the Albemarle Sound vicinity, Allen Parker moved annually from master to master.

I do not know if I can put into words the excitement, almost the sheer joy, that a historian feels at discovering a document like Parker's Recollections. I find these discoveries just as exhilarating as paddling into a swamp wilderness or exploring a remote barrier island after a big storm. A whole new world opens up before you — you never know what wonders and surprises will be revealed in that uncharted territory.

He never labored for truly prosperous planters, but at times, he was leased to relatively wealthy men. Darias White, for instance, employed 40 slave loggers and teams of mules and oxen in a local swamp, where they harvested old-growth hardwoods for shipbuilding timbers. More often, Parker worked for one-mule farmers who could not afford to own a slave or even to hire slaves except after exceptionally good harvests.

During his childhood, Allen Parker lived among several "good masters," hardworking men with whose families he shared meals. Within the boundaries of his enslavement, these masters treated him decently. He had a special fondness for a small farmer and storekeeper named George

Williams, recalling that he played with Williams' children and learned some of their school lessons: "I had many good times playing with the other children[,] for whatever the grown white people might think about the colored people, the little children did not know any difference when they were allowed to play with the slave children."

Young Parker also worked for brutal, malevolent masters who beat him, kept him hungry, and tried at every turn to subdue his spirit. A farmer named Small was among the worst. He beat Allen's mother severely and worked her day and night in the fields and in his kitchen while she was still breast-feeding a new baby. Confronted with men so vile, Allen and his mother ran away several times, seeking refuge with other slaves or white friends.

When the Civil War broke out, Parker was among the thousands of slaves who escaped from tidewater plantations to Union territory. The Union army captured the Outer Banks and most of the state's seaports by early 1862, and Albemarle slaves staged a colossal boatlift to freedom behind Union lines. While other Albemarle slaves confiscated sloops or built makeshift rafts and sailed to Union outposts as far away as Roanoke Island and the Outer Banks, Parker did not have to travel so far. He rowed out to a Union gunboat that had come up the Chowan River.

During the Federal occupation, Parker served in the Union navy on the North Carolina sounds. He later worked at a Beaufort sawmill before departing the South as a merchant sailor. He eventually settled in Worcester, married and raised a family while working as a street peddler.

Recollections of Slavery Times may be most important for describing the daily rhythms of slave life in the Carolina tidewater. Parker neither neglects nor lingers over slavery's terrors. Instead, his genius is in chronicling the details of daily life. He spends four pages simply describing a typical slave cabin — its construction; the composition of its beams, mortar, roof, chimney,

Continued

A HISTORIAN'S COAST

doors, and windows; even the cooking utensils and furniture within it.

Parker is like that with everything, and it is this accretion of ordinary details — his diet, clothing, pastimes, religion, music, family — that allows him to distill an essence of slavery far more telling than a litany of atrocities alone.

Parker had a special awareness of the ways in which his masters relied on African American knowledge of agriculture and the earth. My colleague Peter Wood has documented how West African slaves introduced rice cultivation into the Low Country of South Carolina, a critical step in colonizing the tidewater there and along the Lower Cape Fear. Today's historians share a growing appreciation for the West African roots of agriculture in the early South.

But Parker seems to be making a broader argument. He is not merely saying that slaves brought knowledge of West African crops to the Americas, but also that they gleaned new lessons out of the American woods, fields, and waters simply by working in them and relying on them far more extensively than did their masters.

"Being out of doors a great deal of the time, and having no books, [we slaves] learned many things from the book of Nature, which were unknown to white people, notwithstanding their knowledge of books," Parker wrote. "And it often happened that the master would be guided by the slave as to the proper time to plant his corn, sow his grain, or harvest his crops, and many things of this kind, which were to the master a source of care and anxiety, seemed to come to the slave as it were by instinct and not often did they make a mistake in their prophecies."

This reliance on slaves and their knowledge of the "book of Nature" is scarcely surprising. The men and women who toiled in fields of cotton, tobacco, wheat, and corn — day in and day out, year after year — became intimately acquainted

with every aspect of cultivation: clearing land, fertilizing, ditching, sowing, weeding, harvesting, selecting new seed for the next crop. Overseers came and went. Planters often were diverted by other business interests, but slaves got their hands dirty sunup to sundown every day — and learned the lessons that the earth had to offer.

Parker must have learned a great deal about nature when he worked at Darías White's timber camp near the Great Dismal

would be built at night." This sort of camp life is not our usual image of slavery, but it was very common in the timber, shingle-making and naval stores industries. Slaves like Parker developed a unique knowledge of the forest ecology from spending months in such camps.

Whether in swamp or field, the slaves were intimately bound to the "book of Nature." They related to nature in a way that was different from their masters. For instance, planters told time with watches and clocks. "The slaves," Parker wrote, "were obliged to depend upon the sun, moon, and stars and other things in nature."

Of course, Parker and his enslaved brethren did not utilize their familiarity with the "book of Nature" only to raise their masters' crops and cut their timber. They frequently employed the same knowledge to weaken the grip of bondage on their lives. The slaves — depended upon by the planters for their knowledge of agriculture, fishing, and forest industries — thus achieved at least a small shift in their favor in the never-ending power struggle between master and slave.

Just as they learned to rely on the moon and stars in the absence of mechanical clocks, so Albemarle slaves looked in ingenious ways to their natural environment to improve and vary their food rations — and gain a small but important foothold outside their masters' households. Parker described, for instance, how slaves turned pine needles and small twigs into tea and made coffee out of burnt corn and wheat.

Albemarle slaves also enriched their diets with wild game. "Night," Parker wrote, "was the slave's holiday." It was no accident that he devoted a long chapter of *Recollections* to how slaves hunted raccoons, opossums, and other nocturnal game. "The slaves believed that the wild game was intended for them," he observed, "for while the master was enjoying his roast beef or



These mortars for threshing rice are believed to have been made by slaves in Camden County.

Swamp. There, he drove oxen teams that hauled 100-foot logs out of the swamp to blackwater streams where they could be floated to a sawmill. "I liked this sort of work very well as it was not often hard, and there was a great deal of excitement about it," he remembered.

That year, Parker was among 40 or so slaves who "camped in the woods through the entire lumber season." They lived in a camp "made of logs, bark and pieces of board, which would enclose the camp on three sides, [and] on the fourth a large fire

lamb, he did not think that his slaves needed anything of the sort."

Sometimes, the slaves' game was not quite as wild as raccoons and opossums. Tidewater farmers allowed their hogs to graze freely in the woods, where they lived cheaply off acorns and roots until rounded up for slaughter. Multitudes of these hogs lived in coastal woodlands, and their rapacious grazing habits contributed to the forests' parklike appearance. Many hogs grew wild over generations, resembling wild boars.

Runaway slaves relied heavily on feral hogs, but Parker pointed out that they were also important to plantation workers still in bondage. One of his harshest taskmasters was a farmer named Elisha Buck. "He did not treat us at all well," Parker noted, "and it was not often that we had all we wanted to eat." Buck caught and whipped Parker and another slave the first time that they killed a free-grazing hog.

"It did not do much good to either of us," recalled Parker, "for on the following Sunday I went into the woods again and got another pig which I dressed in the night." He realized that there were many poor whites quite willing to take advantage of a neighboring planter's hogs so long as a slave took the risk for them.

"As I did not have every advantage of a first-class slaughter house I was obliged to manage as best I could," Parker wrote. "Accordingly I built a fire and gave the pig a good singeing and while he was warm from the effects of the fire. I put him into water, and then scraped him with a case-knife and finally got him clean.

"When he was properly dressed," he continued, "I carried him on my shoulder about three miles, and turned him over to a 'poor white' who took him to a neighboring town the next day, and sold him for me. I got back to quarters before the hands were

called in the morning so that no one knew where I had been.

"In due time the 'poor white' gave me my share of the money he got for the pig. With this money I bought some cloth, which a white woman made into a coat and a pair of pants for me."

Many planters allowed slaves to keep vegetable and herb gardens around their cabins, so long as they tended them only in their spare time. Other slaves clandestinely trapped, fished, and gardened in the wild, keeping the fruits of their labor for their own tables or, like Parker with his hog, trading them with poor whites nearby. A desire for

believed that his language was not understood by the white folks," he recalled.

According to Parker, Albemarle slaves found meaning in all sorts of natural signs. "A cloud over the moon, a rainy night, the barking of a dog, or any other circumstance [that] seemed to aid them in carrying out their plans, they thought that it was intended especially for their benefit," he wrote.

This sense that nature was on their side might arise in any oppressed people living off the land. But I wonder if, to some degree, this conviction originated in a theological outlook prevalent among the Ba-Kongo, Igbo, Asante, and many other West African peoples imported to the Americas. Their religious backgrounds were very different, but most did share a world view in which ancestors played an active role in the affairs of the living. Many believed that the ancestors sometimes expressed themselves through wild animals and natural events. Most also believed in lesser deities, or spirits, that were keepers of rivers, forests, and other wild places, which further imparted a sacred character to nature.

I do not know how deeply the attitudes of Albemarle slaves toward

nature embodied African spiritual beliefs. Certainly, I have observed an intimate communion with coastal lands among the most knowledgeable of the old-timers — black, white, and red — with whom I have had the privilege of exploring swamps and forests.

Nevertheless, when I read through Allen Parker's *Recollections*, I am drawn again and again to the almost sacred attitude that Albemarle slaves displayed toward the natural world. And at such times, I wonder if in those pages we might have far more to learn than I ever expected — and not just about the past. ■



Slaves in Stokes County are believed to have made this white oak basket used for holding cotton.

more varied, healthier diets led slaves whenever possible into their own gardens, into the forest, and on to the rivers and sounds.

Parker shows how slaves relied on the "book of Nature" beyond simple knowledge of the land to a more personal relationship with, and even communication with, the natural world. For instance, slaves used the subtle variations in owls' calls to take heed of the approach of their masters, which enabled them to hide successfully or to labor clandestinely for their own gain.

"The slaves not only believed that the owl was their friend, and that his language was intended entirely for them, but also

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Pier Enjoyment

Lifelong Lessons

Many of us still associate autumn with “back to school,” even though most schools on a traditional calendar now start the new year in August.

And in my neighborhood, a year-round school schedule means that by September, many of the youngsters get a three-week break — a wonderful time to take a learning vacation at the coast.

So, indulge me, if you will, as we offer an educational package in this Autumn issue of *Coastwatch*. We’ll offer several lessons for the post-baccalaureate crowd and a “recommended reading” list.

First, though, I remind you to watch for coastal learning opportunities everywhere — just ask folks who were strolling through Raleigh’s Crabtree Valley Mall in late July and happened upon a lesson in shark nurseries or shark migration.

Yes, those were scientists and a commercial fishing captain offering their first-hand knowledge of shark behavior, life cycles and habitats. And there was Sea Grant’s own Lundie Spence dazzling youngsters, even transforming a few into sharks with the help of some gray material and cardboard fins.

In my two years with Sea Grant, we have been invited to a variety of environmental festivals and teacher workshops, not to mention the annual commercial fishing show and the hurricane expo. But this was the first request I received from a shopping mall.

The folks at Discovery Channel had chosen Crabtree as one of a handful of malls across the country to host a grand preview of the cable channel’s annual Shark Week program. But Crabtree took the idea a few steps further, requesting that Sea Grant, the North Carolina Aquariums and Triangle area dive shops present information about sharks in North Carolina. We were happy to oblige — and were eager to introduce Sea Grant to a new audience.

We also took the opportunity to showcase results of research from North Carolina Fishery Resource Grants, a program administered by Sea Grant.

David Beresoff, a commercial fishing captain from Brunswick County, and Teresa Thorpe, a biologist at the University of North



Carolina at Wilmington, discussed coastal shark nurseries and efforts to choose netting that would catch targeted fish but fewer sharks. Their display — which included samples of various species, including a bull shark more than three feet long — drew many questions and a few gasps.

Roger Rulifson, a biologist at East Carolina University who has worked with a number of commercial fishers on FRG projects, also gave a pair of presentations on migration patterns of the spiny dogfish, the only shark species that has been commercially targeted in North Carolina waters.

You can learn more about the FRG research on sharks in Cynthia Henderson Vega’s Sea Science article on page 20. Also in this issue, we take you along on a pair of Sea Grant-sponsored workshops — one along the coast and one in the coastal plain.

Ann Green joins teachers from North Carolina and other states who want to take lessons from the deadly deluge that accompanied Hurricanes Dennis and Floyd in September 1999. Many communities and countless families still are recovering from the record floods, especially along the Tar River and its tributaries.

Pam Smith joins Lundie and Sea Grant colleague Walter Clark to look at differences development makes along barrier islands. The field study, presented by the Encore program at North Carolina State University, targeted Masonboro Island, Bald Head Island and Wrightsville Beach.

Well, it looks like you’ll have a sampling of biology, geology and public policy. How about some history? We have another essay by David Cecelski. His collection of *Coastwatch* columns, *A Historian’s Coast: Adventures into the Tidewater Past*, is drawing readers and listeners as David visits bookstores from the Triangle to the coast.

And speaking of books, check out the recommended reading list in Book Market on page 23.

Now, visiting the coast is not always serious business. Sometimes you just want to grab your fishing pole and head to the nearest pier.

But first you may want to read Ann’s cover story that highlights this coastal tradition — and you may learn something new.

Katie Mosher, Managing Editor

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Coastwatch

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*Table of contents photo of Masonboro
Island by Scott D. Taylor.*

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COASTAL TIDINGS



Michelle C. Sturnak

Dive into Seas 2000

The deep blue sea long has had a special attraction. And this fall, the Seas 2000 Scuba Expo will draw underwater enthusiasts of all kinds to Raleigh.

The show — which organizers hope will become an annual event — will be Oct. 14-15 at the North Raleigh Hilton Convention Center on Wake Forest Road.

The nearly 50 exhibits — including North Carolina Sea Grant — will delight divers, snorkelers, and anyone interested in the aquatic environment. Activities will include the chance to try scuba in the hotel pool, an underwater photography contest,

diving seminars, a film festival, a silent auction of scuba equipment, and children's seminars.

Daily admission will be \$10 for adults and \$5 for children under 12. Discount tickets will be available in advance from the Triangle area dive shops, which are sponsoring the expo along with the N.C. Association of Dive Operators.

For updates and more information, contact your local dive shop, or please check the Web at www.seas-expo.com, or e-mail Carri Owens-St.Germain at seas@ipass.net.

— K.M.

In the Next Issue of *Coastwatch*

More and more women are enjoying the excitement of fishing tournaments, as Ann Green finds out when she goes along with some first-class competitors. And she'll see how such anglers are changing the face of an industry. Meanwhile, Pam Smith examines water woes facing many coastal communities. Water quality, quantity and wastewater disposal pose both scientific and political questions.

Celebrate Swan Days

Celebrate the return of thousands of tundra swans to Lake Mattamuskeet during Swan Days, Dec. 2-3, at the Mattamuskeet National Wildlife Refuge in Hyde County.

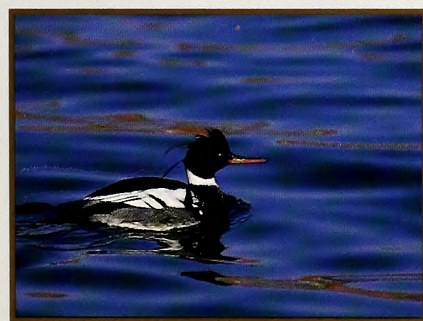
Activities highlight the ecology, history and culture of the area — and provide abundant photo opportunities. The 50,000-acre lake is the winter home for swans, Canada and snow geese, and other water fowl. It's also a rest stop for dozens of bird species migrating along the Atlantic Flyway.

For a close look of wildlife around

lecture and slide show at 7 p.m. Dec. 2, in the Mattamuskeet Lodge.

Tours of the refuge and lodge are on tap throughout the weekend. And history buffs wanting more details can meet Lewis Forrest, founding director of The Mattamuskeet Foundation. He'll talk about his new book, *Lake Mattamuskeet: New Holland and Hyde County*. The book is featured in "The Book Market" on page 23.

David Cecelski will talk about his book *A Historian's Coast: Adventures into the Tidewater Past* both days.



the lake, visitors may join a "Volksmarch" — a people's walking group — led by the Rowan County Roamers. The volksmarch, a popular community activity in Germany, encourages year-round nature treks.

Dave Allen, director of the North Carolina Wildlife Coastal Plain Endangered Species Project, will give a more technical view of the refuge. He will report on the status of wildlife during a

Local artisans will exhibit wildlife-related arts and crafts, and the North Carolina Wildlife Commission will premiere a mobile aquarium featuring freshwater fish.

Swan Days is free and open to the public. Some activities require pre-registration. For information, call 252/926-9311, or go to www.albemarle-nc.com/hyde/events/swandays.htm.

— P.S.

CMAST Opens in Morehead City

Research, education and extension programs in marine sciences are spotlighted in a new facility on Bogue Sound.

North Carolina State University's new Center for Marine Sciences and Technology (CMAST) will be dedicated Oct. 13. The program begins at 1 p.m., with a ribbon cutting at 2 p.m. and an open house at 2:30 p.m.

CMAST will include a regional office for North Carolina Sea Grant. "This facility will increase our visibility to the public and invigorate our extension staff," says Ron Hodson, Sea Grant director. "And it will encourage greater interaction with the research community."

Located just off U.S. 70, the center also will house NC State's Seafood Laboratory, as well as classrooms for Carteret Community College. David Green, director of the Seafood Lab and a Sea Grant researcher, is CMAST director.

Sea Grant staff members with first-floor offices include fisheries specialist Bob Hines, mariculture and marketing specialist Philip "Skip" Kemp and secretary Vanda Lewis. Their phone number is 252/222-6307.

Barry Nash, Sea Grant seafood technology specialist, will have an office in the Seafood Lab on the second floor. His phone number is 252/222-6337.

The mailing address is 303 College Circle, Morehead City, NC 28557.

Fisheries Report Card

Fish Farming Focus

Learn more about the expanding aquaculture opportunities in North Carolina during a special field day program Sept. 30.

The event will be from 9 a.m. to 1 p.m. at the Vanguard Fish Farm in Chocowinity. The location is off U.S. 17 on Fire Tower Road in Beaufort County.

The focus will be on current operations for hybrid striped bass and catfish farming. Participants will see demonstrations of holding tank systems and a portable in-pond grader — and the use of border collies to control birds.

Discussions also will include the potential for yellow perch and flounder aquaculture, including updates on the latest research from North Carolina Sea Grant.

For more information, contact Steve Gabel at 252/482-8431 or Mike Frinsko at 252/757-2802. — K.M.

Hurricane Floyd prevented some fishers from catching fish — 1999 saw the smallest seafood harvest in 26 years. But the storm apparently had minimal impact on the overall health of North Carolina's fish stocks last year.

The N.C. Division of Marine Fisheries (DMF) 1999 annual stock report, released in July, indicates that several important coastal fisheries are on the road to recovery. Of the 39 stocks listed in the DMF report, 12 are listed as "viable" and "recovering," eight are listed as "concerned" and 10 are listed as "overfished."

Finfish are showing most improved signs, the report says. While red drum, the state saltwater fish, still is listed as "overfished," several good years' classes are making their way into the spawning stock. Weakfish and summer flounder continue strong recoveries.

Among the "viable" stocks are Atlantic menhaden, dolphin, spotted sea

trout, striped bass in the Albemarle and ocean, and shrimp.

On the "concerned" list are Atlantic croaker, black sea bass, striped mullet, reef fish, bay scallops, oysters and crabs.

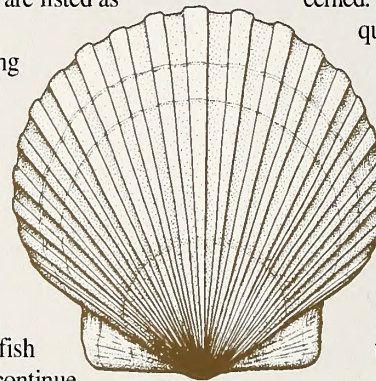
Among the "overfished" are black sea bass north of Hatteras, monkfish, river herring in the Albemarle, Atlantic sturgeon and spiny dogfish.

Bay scallops were downgraded from "viable" to "concerned" due to several poor spawning seasons. Oysters were reclassified from "overfished" to "concerned." Habitat disturbances, water quality and disease play as much of a role in the status of oysters as overfishing, the report says.

DMF director Preston Pate attributes improvements to "important strides North Carolina has made in fisheries management over the years."

Fisheries management plans map out long-term management strategies for the state's economically important species. — P.S.

Illustration by John Norton



22 Fishery Resource Grants Awarded

Will octopus become a common catch for Tar Heel fishing vessels? And how many bottlenose dolphins call the bays and sounds of North Carolina home?

Some curious North Carolinians want to know. With support from the North Carolina Fishery Resource Grant Program (FRG), they plan to find out. More than \$600,000 has been awarded this year to people looking for new ways

to improve or protect the state's coastal resources and fishing industries.

Research topics reflect the varied concerns of coastal industries — ranging from the exotic to more commonplace problems, such as how to handle seafood safely or how to bring in lots of an intended catch while leaving other species unharmed.

Twenty-two research proposals were accepted in the first round of FRG funding this year. Additional proposals received in June are now under review. Proposals for the 2001 cycle will be due Dec. 1, 2000.

The FRG program has been a model for other states. Its premise is that the people who make a living from the water are likely to have unique ideas regarding coastal



Scott D. Taylor

Wings Over Water Birding Activities

Wildlife on the Outer Banks, whether it flies, crawls, swims or runs, is a never-ending source of interest and pleasure.

In celebration of the remarkable diversity of the Outer Banks' ecosystems, the Fourth Annual Wings Over Water festival offers the amateur as well as the expert naturalist an opportunity to sample a variety of bird watching and wildlife activities.

The festival, which includes more than 100 field trips, will be held Nov. 3-5 at

several locations on the Outer Banks.

Bird watchers can explore breathtaking wildlife in the maritime forests at Nags Head Woods and Buxton Woods, take a canoe ride on the black waters of Milltail Creek, or experience a red wolf howling.

For more information on the three-day event, call Jack Thigpen, North Carolina Sea Grant, at 252/441-3663 or the Outer Banks Chamber of Commerce at 252/441-8144. For a full schedule, check the Web: www.northeast-nc.com/wings/. — A.G.

problems and solutions.

Recipients are encouraged to work along with academic researchers from various universities and community colleges to assure scientific validity of the projects. With growing demands on coastal waters, such collaboration can help protect marine resources as well as the heritage of fishing communities.

North Carolina Sea Grant administers the FRG program, which is funded by the N.C. General Assembly. Since its creation in 1994, nearly 200 projects from all regions of the coast have been funded.

The grant selection committee was reformulated in 1999 to include representatives from the N.C. Marine Fisheries

Commission and its advisory panels, the N.C. Division of Marine Fisheries, and North Carolina Sea Grant.

Ron Hodson, North Carolina Sea Grant director, says the new selection committee offers opportunities to applicants who have good ideas but who may not have adequate experience in writing research proposals. "I am pleased," he says, "that the new grants committee has enabled us to include a revision process that allows us to award more grants."

For more information on the FRG program and a list of recipients, check the Web at www.ncsu.edu/seagrant and follow the research link. — C.H.V.

September Sweep-Up

September is time to celebrate a Sea Grant legacy: The North Carolina Big Sweep.

This year, volunteers will gather across the state Sept. 16 to clean up the beaches, sounds and inland waters.

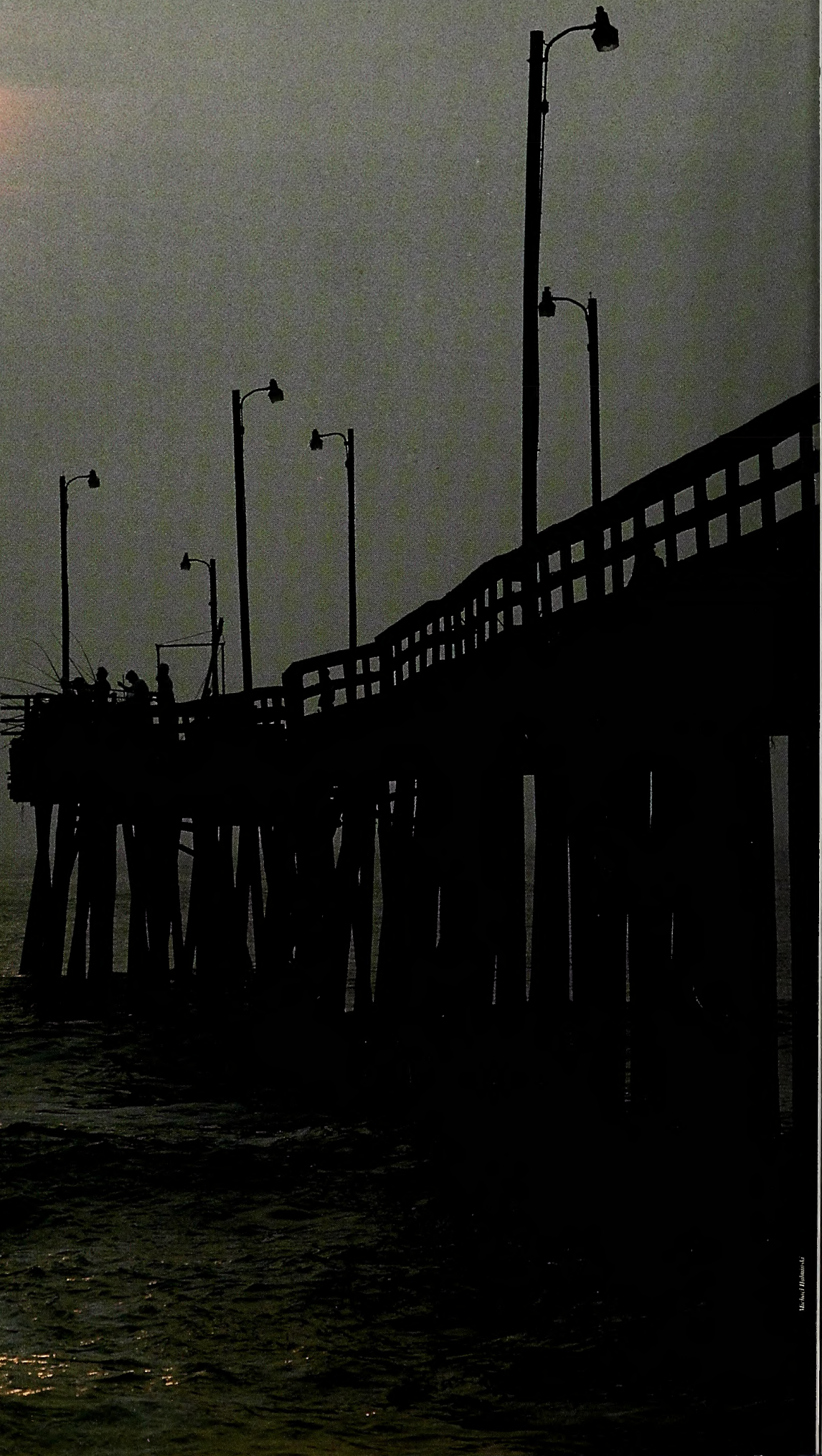
But if you can't participate that day, don't fret, says Lundie Spence, North Carolina Sea Grant marine education specialist and Big Sweep founder. Environmental awareness is a year-round activity.

"Every time you visit the coast or a stream, look for litter and debris," Spence says. "A foam cup or plastic milk jug can be dangerous to sea birds, turtles and other creatures."

If you would like to volunteer for the official Big Sweep program, now in its 14th year, contact the coordinator in your county. For general information, contact the state headquarters at 919/404-1600. — K.M.



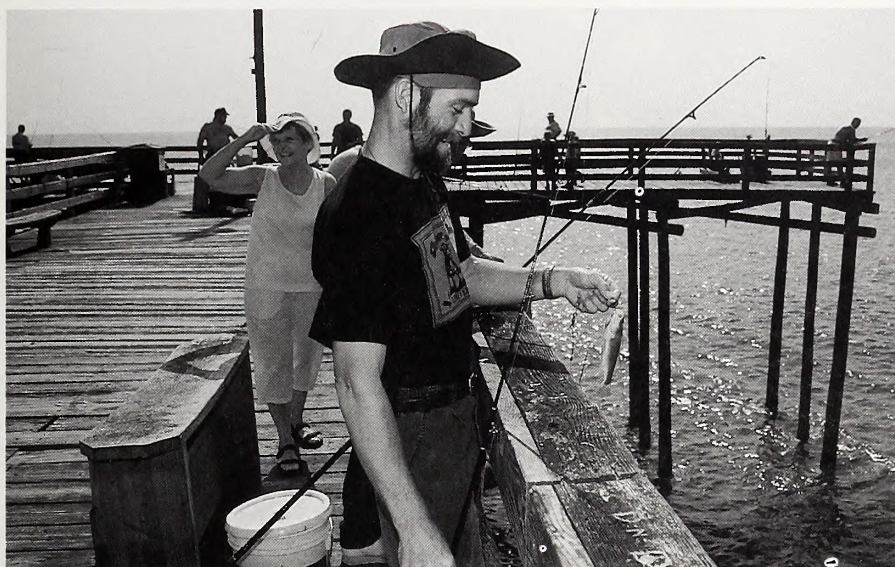
Despite the
stereotypical image
of a fisher,
piers draw a
cross section
of people —
from professionals
and blue-collar
workers to
students and
young children.



ANGLING FROM PIERS:

Fall Is Prime Fishing Season in North Carolina

By Ann Green



Scott Belcher of West Virginia gets ready to put live bait on his line.

At left: By sunrise, the Hatteras Island Fishing Pier at Rodanthe starts filling up.

As the sun begins to cast a metallic glaze over the deep blue water around Nags Head Fishing Pier, Jessica Massie dangles her rod over the wooden railing into more than 16 feet of water.

Standing elbow-to-elbow next to a row of men a head taller than she is, Jessica, 12, reels in the line. Then she throws her line back into the water so fast that it looks like it is dancing.

After many tries, she feels a jerking motion on the end of the line. Jessica's friend Sam Phillips helps her pull in the first fish she ever caught.

"This is exciting," says Jessica of Waynesboro, Va., while holding up a shiny bluefish. "I have been fishing a lot and never caught anything before."

After Jessica pulls in her prized 12-inch bluefish, almost a dozen anglers throw in their lines near the end of the pier. Within a few minutes, several bluefish are fluttering on the pier's wooden floor.

"It's either feast or famine at a fishing pier," says Billy Sizemore of Stephenson, W.Va. "When you see someone hook a fish," you might see 15 lines go into the water.

For Sizemore and others, pier fishing has become a summertime ritual. Fall is prime fishing season for red drum and other fish.

"I come here every day," says Al Mintor of West Virginia, who spends the summers at Kill Devil Hills. "I like this pier. It is where I have the best luck. I caught four or five bluefish today. It is relaxing because there are no wives or telephones."

Mary Nelson, a clerk at Nags Head Fishing Pier, says anglers become attached to one pier and do all their fishing from there.

"I know from being at different piers that they pick one pier, and you can't pry them off of it," says Nelson.

Ocean pier fishing attracts anglers for a number of reasons. "It is entry-level fishing and economical," says Andy McCann, owner of Nags Head Pier. "It is easy, and you don't have to have a cast. You can just let a line drop straight down."

In North Carolina, 25 public fishing piers dot the coastline — from Avon to Sunset Beach — according to the N.C. Division of Marine Fisheries (DMF).

This is a decrease from 34 piers documented in 1962 in Robert J. Goldstein's *Coastal Fishing in the Carolinas From Surf, Pier and Jetty*. Many have been destroyed by hurricanes and not rebuilt.

"The number of piers has declined because it is costly to rebuild them," says McCann.

With booming development along the coast, Mike Robertson, owner of Kure Beach Pier, says that some communities do not support public piers.

Continued

"A lot of communities are looking down on piers," says Robertson. "Now that communities are maturing, they don't want to put up with blue-collar guys. A lot of professional people just want to stand behind a plate glass window at a motel and drink Scotch."

Despite the stereotypical image of a fisher, piers draw a cross section of people — from professionals and blue-collar workers to students and young children.

"You always notice the diversity of people," says Mintor. "It is like going in a Wal-Mart."

Many anglers are regulars who arrive when the sun begins to rise — and just as the fish are starting to bite. They cart the fishing gear in a variety of ways — from little red wagons usually used for kids' play to luggage carts.

Six days a week, the Rev. Brad Bradshaw, the minister of Kitty Hawk Methodist Church in Kitty Hawk, rolls his cooler down the pier. He usually fishes near the front of the pier and uses plastic grub to fish for trout or other bottom fish.

"I come for the people more than the fish," says Bradshaw. "Fishing is sometimes the only quiet that I get. It is a great place to drop your blood pressure."

For the larger fish, including kingfish or king mackerel and Spanish mackerel, regular anglers like Mintor gather at the end of the pier.

Mintor works hard to catch fish. He practices a special technique called plugging in which he is constantly casting and retrieving his line.

"We twitch the line and try to make it dance," he says. "We are trying to duplicate the way a living fish tries to find food."

Some regulars, like Skip Coup of Knightdale who is fishing for king mackerel, have two fishing rods dangling in the water. One of Coup's rods has an anchor. The other has live bait. The two lines are attached with a special handmade rig.

"The rig gives me visibility," says Coup. "I use a 10-gauge wire and bobber weight for my rig. It is stronger than a clothespin. When the fish takes the bait, the two lines unsnap."



Scott D. Taylor

Shark Fishing

On summer nights, shark fishers also congregate at piers. Although shark fishing is legal in North Carolina, only a few piers allow it, usually from after dusk to dawn.

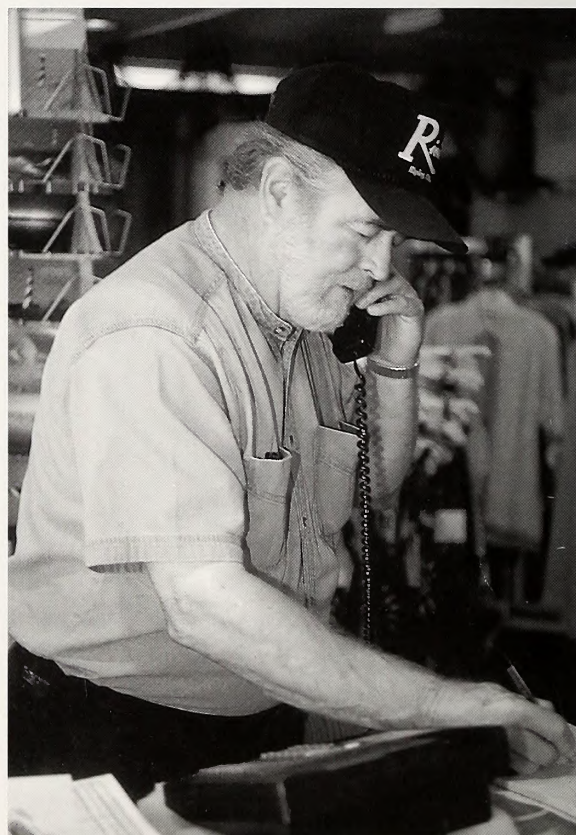
"Shark fishing is almost a thing of the past," says Avon Pier manager Billy Hawkins as he points to a shark's head on the wall. "It is a lot of trouble getting the head out of the water. We have one fisherman who comes down once a year and tags sharks."

Once a week, David Wolfe of Grandy fishes for sharks off the end of Jennette's Ocean Pier in Nags Head.

"It is an inexpensive way to catch big fish without going out in a boat," says Wolfe. "I have caught sharks up to 500 or 600 pounds."

Wolfe learned the art of shark fishing many years ago from a friend. "It is like deer hunting," he says. "Fifty will try it, and only one will stick with it. It requires a lot of patience."

To catch sharks, Wolfe uses special equipment and bait. As the waves rock



Michael Hamrick

Top: Fishing is a summer and fall ritual at the Iron Steamer Resort and Pier at Pine Knoll Shores.

Above: Customers call Billy Hawkins for updates at Avon Pier.



Michael Halimowski



Michael Halimowski

Top: At Avon Pier, two young men cut the hook off a skate.

Above: Sara Wetzell (left) and cousin Katie Torsiello from Hagerstown, Md., delight in fishing from the pier.

against the pier pilings, he launches a spider kite — which is attached to a lollipop and line baited with a five-pound tuna head — 300 feet away from the pier. As soon as the lollipop melts, the kite flies away, and the line stays in the water.

After waiting several hours on the end of the pier, Wolfe doesn't catch anything. However, the week before he had pulled in a 190-pound sand tiger.

When Wolfe does pull in a shark, he says the tug on the reel creates a "screaming noise so loud that it can be heard down to the pier house."

Usually a crowd congregates while Wolfe gathers special equipment to reel in the big catch. First, he straps on a harness around his waist and then uses a clip rope to pull the shark onto the beach.

Even for an experienced angler like Wolfe who averages three sharks a season — eight during a good year — shark fishing can be dangerous. One time, he broke his ribs while pulling in a shark.

"Once I was on another pier and my reel went off," says Wolfe. "I put on my harness and thought it was a small shark. I got thrown up against the railings."

In July, the DMF began restricting commercial and recreational shark harvest in state waters.

Commercial fishers have a bycatch limit of one shark per vessel per day and limited seasons for certain species.

Recreational fishers are allowed only one shark per person per day on a fishing pier or one per vessel per day. All sharks except Atlantic sharpnose or *Rhizoprionodon terraenovae* must be a minimum of 54 inches from the nose to the tail's fork. All other species over 84 inches from the nose to the tail's fork are prohibited except the tiger species or *Galeocerdo curvier*, thresher or *Alopias vulpinus*, bigeye thresher or *Alopias superciliosus*, shortfin mako or *Isurus oxyrinchus* and hammerhead or *Sphyrna* species.

In addition, any shark not retained must be returned to the water in a manner that ensures survival. Any shark retained must have head, tail and fins intact.

North Carolina law states that any species that has a minimum size or bag limit cannot be mutilated.

"These measures are intended to protect juvenile and immature sandbar sharks and juvenile, immature and mature dusky sharks by reducing the direct and incidental harvest of sharks," says Jim Francesconi, a DMF fisheries biologist. "We also are trying to stop the practice of finning sharks — removing the fins and discarding the carcass — within state and federal waters."

Fall Fishing

Summer isn't the only time that anglers gather on piers. The biggest time of year for pier fishing is fall — September through mid-October.

"This is when adult fish move down the beach to spawn in and around inlets," says Jim Bahen, a North Carolina Sea Grant fisheries specialist. "The big spots

Continued

are running. The water is just right for king mackerel."

Along the Outer Banks, red drum fishing has become a fall tradition. The world record for red drum — 94.2 pounds — was set 100 yards from Avon Pier.

"Drum fishing is like a ritual," says Hawkins. "People don't see each other all year. It is just like a club. They come from all over the country. One guy comes from Texas. They fish all day and night."

In the fall, subsistence fishers also flock to Outer Banks piers to stock up on spot for winter food.

"Some people still fish to supplement their pantry," says Norman Bradford, who serves on the North Carolina Marine Fisheries Commission's Northeast Regional Advisory Panel. "They salt the spot down or will freeze it and use it in the winter."

Anglers aren't the only ones who congregate at piers. During summer evenings, there are as many spectators as fishers. Most piers charge a nominal amount for sightseers.

At Nags Head Pier, the spectators include a young college couple who sit on a wooden bench and watch the seagulls flutter over, and a large stingray being pulled in.

"It is fun because you get to see a lot of interesting stuff," says Jackie Black, an Allegheny College student who is dressed in black sequined jeans. "You might get to see a shark come around or see someone clean fish."



Hatteras Island Fishing Pier extends far into the Atlantic.

First Public Pier at Kure Beach

In North Carolina, public fishing piers became popular during the early part of the 20th century. Built in 1923, Kure Beach Pier is the oldest in the state and possibly on the Atlantic Coast, according to *Coastal Fishing in Carolinas From Surf, Pier and Jetty*.

"The first pier was 120 feet long and 22 feet wide," according to the Kure Beach Pier's Web site. "Pier poles were cut from the forest along the river and used as pilings."

"Because very little was known about sea worms or other marine borers, the pier fell down or was destroyed the first year."

Since then, the Kure Beach Pier has been rebuilt many times after hurricane damage, including major damage from Hurricane Hazel in 1954. In 1984, Hurricane Diana took about half the length of the pier.

In North Carolina, piers usually stretch 400 to 1,000 feet long over the ocean. "On the northern end, the piers are shorter because the water is deeper," says McCann.

Most of the piers look alike with wooden benches, lights and large basins for washing fish. They are attached to tackle shops, and some have full-service restaurants.

At Nags Head Pier, customers are

greeted by a sign: "Happiest People in the World Pass Through This Door!"

Inside the wooden-paneled tackle shop, a fishing board boasts some of the recent catch — from an 18 3/4-inch trout to a 26 3/4-inch puppy drum. Another board shows when low and high tide is expected. Behind a counter, there is a wide selection of artificial bait,

tackle, rods and other fishing equipment. On the other side is a restaurant where customers can order hot or cold food.

"We have one gentleman who comes to the pier every morning," says McCann. "He always stops in the restaurant and talks to the waitresses. He comes to the pier more to talk than fish."

During the summer, some parents drop off their kids for the day. "In 15 years, we have raised a lot of kids," says McCann.

Fourteen-year-old Andrew Palomares is a regular at Avon Pier during the summer months. He either works at the tackle and souvenir shop — where he swaps fishing stories with Billy Hawkins — or fishes on the pier.

"I got a 115-pound ray," says Palomares. "I wrestled with it for 1 1/2 hours until I got it in. It was as big as this table. Tonight I am going to fish for 24 hours straight."

Palomares isn't the only diehard fisher who spends the night on the pier.

"We have had people stay for three to four days on our pier," says Hawkins. "We had one man who didn't leave the pier for a month. One even brought a styrofoam mattress. Some set up their sleeping bags like a tent." ■

Saltwater Fishing License Proposal Sparks Debate

When Al Daughtridge takes an afternoon off to trout fish in Pamlico Sound, he often passes commercial shrimp trawlers.

"When I trout fish behind trawlers, all I see is mud," says Daughtridge of Rocky Mount, who is concerned that trawling may damage the sound's bottom.

But as a recreational fisher, Daughtridge doesn't feel that he has any voice in legislation concerning trawlers or other commercial fishers.

"The commercial fishermen have a strong foothold in Raleigh," he says. "Recreational fishermen won't have a voice until a recreational saltwater fishing license is passed."

Many recreational anglers and environmental groups share Daughtridge's viewpoint. For more than a decade, North Carolina legislators have debated a recreational license for saltwater anglers. Although a bill passed the state House in 1999, it did not get out of the state Senate this year.

In the 1999 House bill, individual licenses would cost \$7.50. Blanket licenses for private and charter boats and fishing piers would be priced according to the length of the boat or pier.

"I think it is a bill whose time has come to help protect the state's natural resources," says state Rep. David Redwine, the bill's sponsor. "The bill that passed the House could have been improved by the Senate. It is a shame to have gotten this far and have nothing happen."

Bill Harrell, chairman of the 4,600-member Coastal Conservation Association of North Carolina, also was disappointed that no legislation was passed.

"We were assured that it would come up this year in the Senate," says Harrell.

The North Carolina Fisheries Association opposes the license.

"I represent commercial fishermen," says Jerry Schill, association president. "Many proponents of the recreational license have a real hard time understanding why commercial fishermen are opposed to it. The primary reason is very simple really. What businessman in his right mind would go along with any proposal that would inflict

millions of dollars to a regulatory agency that regulates his way of life? The answer: a really stupid one."

Schill says his industry realizes that fishery regulations are a necessity and that fisheries are a public trust resource that belongs to everyone, including commercial and recreational fishers and seafood consumers.

"However, to expect an industry to accept the notion that more money spent on a state bureaucracy will equate to more fish in the water is absurd," he adds. "History is replete with government failures that have provided millions of dollars being thrown at a problem with the notion that the money alone can provide the solutions."

Some recreational anglers also oppose the license.

"I don't think you should have to have a license to fish in the ocean," says David Wolfe of Grandy. "I am a conservative Ronald Reagan Republican. I don't like government controls."

North Carolina is the only southeastern state that doesn't have some kind of saltwater fishing license. South Carolina requires anglers who fish from private boats to buy a \$5.50 annual saltwater stamp.

A 1998 North Carolina Fisheries Resource Grant survey of anglers found that over 78 percent of respondents would support the saltwater fishing license if the money goes into a designated fund, says North Carolina Sea Grant acting extension director Jack Thigpen, who worked on the project. "They aren't interested in supporting

the license if the money goes into a general revenue fund."

The license would generate about \$11 million a year, according to the survey conducted by William Clifford and Thomas Hoban, North Carolina State University; Vernon Kelly, Coastal Carolina Community College; John Whitehead, East Carolina University; and Ron McPherson, Winston-Salem Saltwater Sport Fishing Club.

The N.C. Division of Marine Fisheries (DMF) estimates that there are between 1.1 and 1.5 million recreational anglers in North Carolina. "We are the largest user of fisheries," says Harrell. "As the largest user of resources, we want to give back to the resource. We want to make sure that the fisheries' resources are maintained."

The General Assembly conducted studies in 1994 and 1996 to determine if North Carolina needed to license saltwater anglers. Both studies determined that a recreational license for saltwater anglers was needed because it would greatly enhance the quality of data collected for the recreational harvest of the state's coastal resources.

"To make prudent decisions about fisheries, we need accurate biological data," says Damon Tatem, who served on the study committee and is a member of the Atlantic States Marine Fisheries Commission.

Through the Fishery Reform Act in 1997, DMF is required to establish fishery management plans for important species.

"We feel like one of the critical pieces of information for managing fishery resources is accurate landings by recreational fishermen," says Preston Pate, DMF director. "To achieve that, we need an accurate account of the number of fishermen so we can expand our samples to everyone harvesting resources."

McPherson, co-chairman of the Inland Advisory Committee of the North Carolina Marine Fisheries Commission, agrees.

"We need to develop management plans so areas don't become overfished," he says. "Our children and our children's children need a place to fish where there are fish to be caught. It has become more and more difficult to even catch enough fish for a dinner." ■

-A.G.



By Pam Smith · Photographs by Scott D. Taylor

ISLANDS IN CONTRAST

Exploring Southern Barrier Islands



Within sight of luxury resorts and bustling coastal communities lies a virtually deserted island. No buildings. No running water. No amenities. Masonboro Island is as pristine as it gets.

Still — or perhaps for that reason — some 45 adventurous men and women step onto the sandy shore to explore the uninhabited barrier island for what will be a day of sand, sea and science.



North Carolina Sea Grant's Lundie Spence and Walter Clark lead the chattering contingency from the Encore Center for Lifelong Enrichment at North Carolina State University. The mission is to learn about a trio of barrier islands clustered along the state's southern coast — Masonboro Island, Bald Head Island and Wrightsville Beach.

The field study will highlight the respective island differences — one under

conservation protection, one in the process of being developed, and another that is fully developed.

Spence, Sea Grant's education specialist, will tell the ecological, geological and biological story of the natural processes at work in the complex coastal system.

Clark, coastal law specialist, will show that increased human interaction with the environment often results in increased policy concerns. For example, while Wrightsville Beach may be fully developed, public policy guarantees access to its oceanfront beaches.

Bald Head is a unique private-public experiment that marries the protection of natural and historic areas with controlled development of this lush, subtropical island.

"Masonboro Island, on the other hand, represents the ultimate policy decision by the state to purchase the property and hold it in perpetuity," Clark says. One of the last wholly undeveloped barrier islands along the southern coast of North Carolina, it is under the protection of the North Carolina National Estuarine Research Reserve System.

"Masonboro Island belongs to all the people of the state. It is a living laboratory for all who are interested in marine ecology and science," Clark adds.

Learn as you go

Betty Poulton, Encore special programs coordinator, has seen to every detail of the three-day experience so that participants broaden their understanding of the natural resources as well as the history of coastal North Carolina.

Encore field trips are never run-of-the-mill sightseeing excursions. Destinations must meet Encore expectations for programs that foster intellectual stimulation and community involvement, says Poulton.

Nature-based trips are designed to encourage a learn-as-you-go approach to environmental issues.

Pat Warner, a veteran Encore member from Raleigh, says, "We don't take notes, and there are no tests. We have fun, learn a lot from the experiences, and come away with more than the average tourist."

Warner adds that Encore's environmental field studies are effective because they are well planned "... and because Lundie is an

excellent show-and-tell kind of teacher. It seems that no matter what you pick up on the beach to show her, she knows about it and can relate interesting facts."

Meanwhile on Masonboro Island, the men and women are beginning to discover indigenous "wildlife."

Ghost crabs scurry and disappear beneath the sandy shoreline, prompting one man to ask, "What use is this tiny critter?"

Spence explains that the lowly ghost crab is an important player in nature's balancing act — the food chain. Some marine biologists say that ghost crabs could be casualties of beach renourishment programs if they are buried by sand that is unsuitable for burrowing. The scientists fear the loss could lead to decreasing numbers of shore birds that depend on ghost crabs for food.

A number of horseshoe crabs along the shore present another teachable moment. Blood from this ancient sea creature is used for medical research, Spence explains.

Horseshoe crabs have become the center of controversy in some mid-Atlantic states, especially Virginia and Delaware. The federal government is enforcing catch limits, pointing to research that suggests that overharvesting will have an impact on migrating shorebirds that feed on horseshoe crab eggs during their spring migration. Horseshoe crabs live in coastal waters, but move inshore during the spring to spawn in estuaries and along shorelines.

However, Virginia's whelk fishery proponents say that catch limits will devastate their industry, which uses horseshoe crabs for bait.

More lessons from the sea

The island has still more lessons to reveal. At low tide, a break is forming in a nearshore sand bar, setting up conditions for a deadly rip current. Sure enough, Spence spots the telltale signs: an offshore plume of turbid water just past the sandbars; foam moving seaward; choppy waves and murky water within the rip current.

Even the most powerful swimmer can get caught in a rip current, Spence says. She tells the group that the most important thing to

Continued



Above: Lundie Spence points out unusual features of jellyfish—a delicacy for sea turtles that come ashore to nest.

At left, top: Encore members spot shorebirds at Bald Head Island with the help of Lundie Spence, left.

At left, middle: Walter Clark, right, talks the dynamics of a barrier island with Jim Tommerdahl. Behind them is Capt. Charlie's Station, where Bald Head light keepers and their families lived in the early 1900s.

At left, bottom: Betty Poulton leads the way for the Encore trek across the barrier island.

remember is to keep calm. "Don't panic. Don't try to swim against the current," she warns. "Swim parallel to shore until you are out of the current. They are usually no more than 30 feet wide."

A walk across the low-profile dunes is an opportunity to inventory adaptive vegetation that helps capture moving sand and anchor the shifting island: grasses, yucca, sea rockets, seaside evening primrose, seaside goldenrod, and poor man's pepper. Bird watchers look for brown pelicans, black skimmers, American oyster-catchers and willets.

Even waiting for the boat for the return trip is not wasted. Spence explains that the marshes and surrounding waters are nurseries for juvenile shrimp and fish. The sound area of the island accounts for about \$350,000 in commercial fish and shellfish annual production.

There's also time to demonstrate the art of keyhole clamming at the water's edge. This technique involves spotting the unique-shaped holes left in the sand by clams as they filter water. No special gear is needed — just a keen eye and a willingness to get a little muddy. To spare hands or feet from sand abrasion, some prefer to use a rake.

Clark also has time to talk about the jetties — one on the northern end of Masonboro and its mate on the southern end of the Wrightsville Beach island. The jetties keep the channel open from the ocean to the Intracoastal Waterway. Sand pulled along the Wrightsville Beach oceanfront is trapped by the north jetty at the expense of Masonboro Island. Increased erosion contributes to the island's susceptibility to overwash — resulting in an ever-changing island profile as sand is carried over and deposited onto the landward shore of the narrow barrier island.

He uses the dynamic nature of Masonboro Island to discuss coastal building policies. According to the Coastal Area Management Act (CAMA), single family homes must be set back from the first stable line of vegetation at a distance equal to 30 times the historic annual rate of erosion. Buildings with more than 5,000 square feet must be set back at a distance equal to 60 times the erosion rate.

The Shell Island Conundrum

After the brief charter boat trip across the channel, the class reconvenes at the Shell Island resort on the northernmost tip of the Wrightsville Beach island. They see a dramatic illustration of what happens when human plans collide with the forces of nature. Since the high-rise complex was built in 1984, Mason Inlet has migrated southward, threatening the nine-story building and other nearby properties.

Clark explains that one proposal on the table is to move Mason Inlet 3,000 feet to its 1986 position. Such a project involves a host of environmental, legal and financial issues.

Nature has written many chapters in the history of the Wrightsville Beach island, which has been a mecca for fishing, boating and beach lovers for more than a century. Its popularity soared in the late 1800s with the construction of a road and trolley line connecting Wilmington and Wrightsville. Since then, the great hurricane of 1899 and hurricanes Hazel, Bertha and Fran claimed lives, sheared back dunes and leveled homes and businesses.

Hurricanes and nor'easters have contributed to the ever-changing configuration of not only Wrightsville Beach, but all of the state's barrier islands.

Almost paradise

The day on the primitive, no-frills Masonboro Island was a marked contrast to the previous day's journey to a 2,000-acre, active resort island community — Bald Head Island.

The island is endowed with a maritime forest, salt marshes, miles of ocean beaches and a rich, but stormy, maritime history. Bald Head Island is part of the historic Smith Island complex, which includes Bluff Island and Middle Island.

Located between the Atlantic Ocean and the mouth of the Cape Fear River, the forested barrier island is the northernmost subtropical island on the Atlantic coast. It is accessible only by private boat or ferry service. On the island, transportation is by golf carts, trams, bicycles or foot.

The Encore entourage boarded a convoy of golf carts for the short drive to



Encore members rest and enjoy nature amidst the low-profile dunes on Masonboro Island.

the east end of Federal Road to reach the Bald Head Conservancy headquarters. There, Gil Powell, conservancy executive director, spoke of ways the organization is working to preserve the island's natural resources and to promote stewardship of the surrounding coastal environment. The conservancy sponsors scientific research and provides environmental education programs.

It is known nationally for the Sea Turtle Protection Program, Powell said. From May through October, Bald Head beaches are nesting sites for sea turtles. Interns from university marine studies programs and volunteers patrol the beaches to record and protect nesting sites. Bald Head volunteers have helped collect scientific data to track turtle nesting trends for nearly two decades.

The conservancy also conducts camps for youngsters and trains volunteers to become part of the protection effort.

Though Powell claims not to be a professional naturalist, he can rattle off turtle facts with the best of graduate students. Conservation has become his avocation and he hopes to learn more about sea turtles from a joint project with the U.S. Army Corps of Engineers. Researchers will do pre- and post-beach nourishment surveys to determine what — if any — impact sand placement has on sea turtle nesting habits along the coast.

"Turtles and humans have a lot in common," Powell quipped. "We both like oceanfront property. It seems that more and more they are in competition with humans for habitat."

Research, he believes, is essential. "Think about it. Turtles have been around for more than 50 million years. They managed to survive whatever killed the dinosaur. It's only within the past 50 years that they have been in trouble."

Some harmful human interactions are easy to spot, he said, picking up a plastic milk jug. "Floating in the ocean, it looks like a juicy jelly fish. That mistaken identity means certain death for turtles."

Triple dose of nature

Virginia Smith, an octogenarian Encore member, is a beach lover from way back. She has fished from piers and inlets, camped, walked beaches and explored maritime forests all along the North Carolina coast.

"I've seen a lot of changes — some by people and some by nature. I admire the work the conservancy is doing here. They and other groups are doing marvelous things to preserve our resources at the coast."

Bald Head presented beach, maritime forest and salt marsh environments for Smith and her Encore colleagues to observe. Beachcombing turned up jelly fish, whelk egg cases and other treasures. The maritime forest spoke to the survival traits of 400-year-old live oak trees. And the salt marshes displayed an array of adaptive plant specimens — cord grass, black needle rush, sedges, sea lavender, cotton bush, red cedar, myrtle and yaupon holly.

A weathered, 1900-era boat house on nearby Bald Head Creek gave testimony to the dynamics of nature at work on the island. Over time, the creek changed course, stranding the structure in the middle of the marsh — a lesson not lost on members of the Encore group.

Reflecting on the field study experience, Spence, who has led a number of Encore field trips, says she enjoys working with "perceptive adults with a wide range of life experiences."

She adds, "This more mature and experienced audience understands how processes and policy work together; that the history and culture of the islands form and shape policy; and that you can't separate science and public policy." ■

For information about: *Encore programs*, call 919/515-5782; *Masonboro Island*, contact John Taggart at the *North Carolina National Estuarine Research Reserve Program*, 910/962-2470; and *Bald Head Island Conservancy*, call 910/457-5786.

Old Baldy is Beacon of History

Bald Head Lighthouse — established in 1817 — is the oldest lighthouse on the North Carolina Coast. But it was not the first or the last to shine a guiding beacon from the island's shores. Barrier island dynamics wrote much of its history.

The first Bald Head Light was constructed in 1794 on the banks of the Cape Fear River. Too close to the river, as it turned out. Erosion took its toll, and the lighthouse fell into the river.

When Old Baldy was completed in 1818, it was to light the way for ships at the mouth of the Cape Fear River until 1866.

As shoaling reshaped the inlet, the beacon shifted to Federal Point at the north entrance to the river. Continued shoaling closed the New Inlet in 1880, and the Federal Point Light was decommissioned.

Old Baldy shone again from the southwest bank of the river's entrance until it was decommissioned in 1935.

The channel through the Cape Fear continued to change, giving rise to the need for an additional coastal light to aid navigation to and from the Wilmington port. In 1903 the Cape Fear Light was constructed on a hill overlooking Frying Pan Shoals near the ocean at the end of Federal Road.

A concrete base is all that is left of that tower today. But nearby stands Capt. Charlie's Station — three simple, clapboard cottages that housed Capt. Charlie Swan, lighthouse keepers, and their families. Capt. Charlie tended the Cape Fear Light until 1933.

The inlet continued to shift. The Cape Fear Light's skeleton tower came down in 1958 when the U.S. Coast Guard turned on the powerful beam of Oak Island Lighthouse from the opposite shore of the Cape Fear River.

But Old Baldy remains an island landmark. Its octagonal tower reflects an early lighthouse architectural style. The Old Baldy Foundation oversees the preservation and maintenance of the lighthouse, which is listed on the National Register of Historic Places.

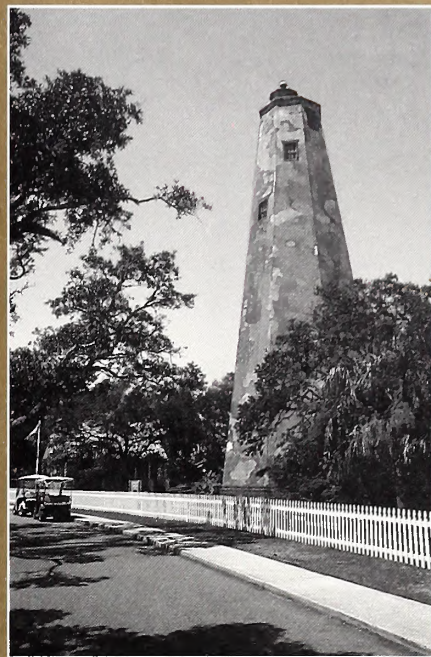
The foundation restored the lighthouse and opened it to the public in 1995. Last spring, members dedicated the Smith Island Museum of History, a replica of an 1850s lighthouse keeper's cottage built in the shadow of Old Baldy.

Jane Oakley, foundation executive director, said members will continue efforts to recover pieces of the island's history.

Much of Bald Head Island's history is colored by its strategic position. Bald Head Island played a vital role in protecting the Wilmington port during the Civil War; the U.S. Lifesaving Service established the Cape Fear Station on the island's east beach in 1882; and the U.S. Coast Guard was posted on the island during World War II.

Today, Bald Head Island is a residential and resort island community accessible by private boat or a passenger ferry from Southport. For additional information, call 800/234-1666.

— P.S.



Floyd
and the
Flood.

As the Tar River flows behind him, East Carolina University marine geology professor Stan Riggs stands high above Princeville on a rebuilt dike that failed during Hurricane Floyd.

Looking down into a flat field with a scattering of concrete steps, Riggs recalls the rushing water that came into the trailer park and "stacked up the trailers against the trees like dominos."

"The dike eliminated part of the floodplain," says Riggs. "The flood water flowed into Princeville at the end of the dike and at a low spot for the railroad crossing forming Princeville Lake. The water came over the top of the dike."

The dike tour is the last stop for teachers on a Hurricane Floyd field trip. With notebooks in hand, elementary, middle and high school teachers from the mid-Atlantic states, Idaho and Tennessee trek around areas flooded in September 1999 during Floyd. Their stops have included Greenville, Simpson and Princeville. The North Carolina Sea Grant-sponsored trip is part of a COAST/Operation Pathfinder four-day course at ECU, "Floyd and the Flood: Implications of a Natural Disaster for Teaching."

The rebuilding of the dike by the U.S. Army Corps of Engineers has received mixed reactions from scientists and community leaders. The new dike is the same height as the original dike built in the 1960s. The only changes are a gravel road on top and a special closure across a railroad crossing.

"In the past, this area had to be sandbagged," says Penny Schmitt, chief of public affairs, Wilmington District of the U.S. Army Corps of Engineers. "This is a stop-log structure that people can put together very rapidly and close quickly. We are cleaning out all the drainage structures. With all the earthwork done, Princeville has back its protection."

Princeville officials supported rebuilding the dike instead of accepting a buyout by the Federal Emergency Management Agency. Founded in 1865 by former slaves, Princeville has historic significance for many residents.

"I didn't see the need to move," says Princeville Mayor Delia Perkins. "The dike had taken care of the town for a long time. This wasn't an ordinary flood. It was 46 feet of water. All the area around here flooded. So why should we move?"

However, Riggs thinks the dike has exacerbated the flooding for Princeville, Tarboro and other upstream areas.

"Princeville sits in a bad physical location," says Riggs. "You couldn't design a worse place to put a town. It is built directly on the floodplain in a narrow zone of a major river bend, immediately below the input of two large tributary systems and above the new Highway 64 road dam."

Riggs' discussion sparks a lively debate among the teachers who will incorporate the information into their curriculum.

Sue Basdikis, a high school psychology teacher in Virginia Beach, Va., supports the town's decision.

"There is a lot of blood and sweat attached to this town," says Basdikis.

"People have roots here. Because of the town's historical significance, I say rebuild and do the engineering around it."

However, June McWhorter of Jacksonville disagrees. "From a scientific viewpoint, I think it is a disaster to rebuild. The town could buy 1,000 acres of the best land and rebuild somewhere else."

Whatever the teachers' viewpoint, course leaders hope the teachers will take the information back to the classroom. The course was coordinated by North Carolina Sea Grant marine education specialist Lundie Spence with instruction and leadership from Vicki Clark, Virginia Sea Grant; Terri Hathaway, North Carolina Aquarium at Roanoke Island; Elizabeth Doster, ECU; Cynthia Rogers, the University of North Carolina at Wilmington; and Debbie Savage, North Carolina State University.

Hurricane Floyd was one of the most devastating natural events in the last 30 years of coastal plain history, says Spence. North Carolina had over \$3 billion in damage, with over 7,000 homes destroyed

Continued

Teachers Learn Science Behind Disaster

Left: ECU professor Stan Riggs gives teachers a lesson on erosion above the Tar River.



Richard Spruill of ECU helps teachers understand how a stream works.



An old cabin on the Tar River near Simpson was damaged during Hurricane Floyd.

and 56,000 homes damaged, according to the National Oceanic and Atmospheric Administration's Service Assessment Report.

"The flood should be used as a teaching tool for earth science," says Spence. "It is a relevant event illustrating a natural disaster and the effects of modification of lands and rivers. The flood connects science, people and policy. One result is to show what options will help prevent future disasters."

Since many of the teachers live in eastern North Carolina, they have first-hand experiences of the flood's devastating effects. "The seminar will provide science and strategy for teaching about a disaster," says Spence.

To help teachers understand what happened during the flood, North Carolina Sea Grant researchers Larry Crowder of Duke University Marine Lab detailed water quality issues, and David Griffith of ECU presented social issues related to the flood. Richard Spruill of ECU and Riggs gave detailed lessons on river systems and wetlands.

Riggs used the Egyptians as an example of a civilization that successfully lived and worked with the Nile River because they understood how the river worked.

"We have forgotten our heritage," he says. "Hurricane Floyd was a human disaster not a natural disaster. Much of the damage resulted from our encroachment into the flood plain. If we rebuild as before, similar disasters will happen again. We need to rebuild within the constraints of the river systems."

LESSON IN STREAMS

Drainage systems are comprised of different-size tributaries that flow into the main trunk river. To get a first-hand look at how streams work, the teachers began the trip at Green Mill Run. While standing knee deep in mud, Spruill shows the teachers how to measure the stream velocity and discharge to track the stream's daily flow.

"I've found that kids like to plot their own data," says Spruill.

Susie Jackson, a Washington middle school teacher, was so impressed with the measurement lesson that she plans to apply for a grant to buy measurement materials for her students. "I want to put the information on the Web," says Jackson.

After visiting the headwaters of Green Mill Run, the teachers go to ECU to evaluate the impact of urbanization on stream flow.

Green Mill Run is an example of channelization — straightening and deepening a stream. Increased storm water runoff from rapid growth and development of ECU and Greenville has significantly increased the stream's velocity and discharge.

Using tape measures, corks and a stopwatch, the teachers measure the stream and find out the velocity. "The stream discharge has increased significantly downstream," says Spruill.

The teachers follow Riggs and Spruill across the campus to where Green Mill Run flooded two campus buildings. During Hurricane Floyd, the basements of both buildings were underwater.

"The buildings have encroached into the flood plain," says Riggs. "Increased building has a cumulative impact. It affects every person in the drainage system."

"Urbanization plays a significant role on a smaller drainage system like Green Mill Run. However, the verdict is still out on the effect of urbanization on a large drainage system like the Tar-Pamlico river system."

To provide flood protection for new buildings, ECU administrators raised the minimum building elevation in 1998 from one to two feet above the 100-year flood plain documented on FEMA maps, according to ECU architect Bruce Flye.

When Floyd came through, the staff tested the elevated building code and found that the new standards would have protected the proposed science technology building from flooding.

"We measured and found out that if the building had been constructed, it would have been 21 inches above the maximum water level," Flye adds.

TOUR OF GREENVILLE

Throughout the day, Riggs made many other stops, including new and old sections of Greenville.

From the 1960s to the 1990s, Riggs says there was significant development in Greenville.

"Greenville is a booming urban area in which the growth has led to the modification of the drainage system and encroachment of the new development further into the floodplain," he says.

As Riggs takes the teachers on a quick tour of Greenville, he points out homes, trailer parks, low-cost student housing and new industries that have expanded into the floodplain along the Tar River and into north Greenville.

He stops at some new homes under construction near the Tar River in Greenville. The homes are in an area that flooded last September.

"We can't build on every piece of land," says Riggs. "The city has recently rezoned this land. We haven't learned anything from our lesson."

The City of Greenville placed a 64-day moratorium on new construction from December 1999 to February 2000.

The moratorium allowed a committee to reach a consensus on new flood-elevation building lines. The Greenville City Council voted to raise the minimum building to one foot above the base flood elevation for stick homes and two feet above the base flood elevation for mobile homes. "This creates a greater safety for people and properties located in the 100-year floodplain," says city manager Ron Kimble.

Some of the hardest hit areas were in north Greenville. Some trailers still look like they did when the storm hit. A child's bunny rabbit hangs out the doorway of one mobile home. Another one has clothes stacked inside.

"This was a socioeconomic flood," says Riggs. "The major damage in Greenville was to the poor."

SEDIMENT POLLUTION

To help the teachers understand sediment pollution in North Carolina's river, Riggs took the teachers to the banks of the Tar River in Simpson.

While standing on the river banks near a wooden cabin, he says that the flood caused the sediment to build up in the floodplain.

"Water poured over and eroded the river banks, the agricultural fields and areas of bridge and highway construction," he says. "Sediment pollution is a major problem in North Carolina's drainage system. Sand fills the channels, and mud holds and traps contaminants."

While looking at a cabin damaged by the flood, the teachers also have a brief lesson on the river's erosion.

"Twenty years ago, the cabin was 50 feet back," Riggs says between bites of a sandwich. "The bank is eroding two feet a year."

Although the teachers were exhausted at the day's end from the heat and many stops, most viewed this part of the seminar as an excellent learning experience.

"I am going to take this information back and debate it in the classroom," says Arleen Linehan of Kill Devil Hills. ■

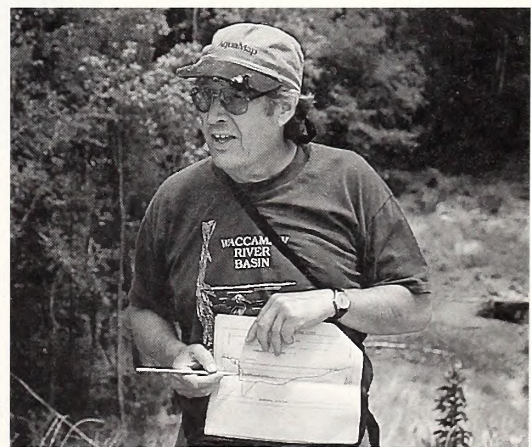
"Floyd and the Flood: Implications of a Natural Disaster for Teaching" is included in the sequence to the COAST/Operation Pathfinder courses offered to mid-Atlantic teachers since 1994.

Funded by the National Ocean Partnership Program and the Office of Naval Research through the University of Southern Mississippi, the seminar supports education mandates to incorporate the most recent research in science and education technology into teaching curricula.

To find out more about COAST, read the Autumn 1999 issue of Coastwatch or log onto The Bridge: www.vims.edu/bridge/ for information by following the link under professional development to teacher programs.



Teachers use tape measures, corks and a stopwatch to measure the stream and its velocity at Green Mill Run.



Riggs gives a colorful tour of Tar River communities damaged by Hurricane Floyd.

Grants Yield Net Gains for Sharks

By Cynthia Henderson Vega

With no breeze, the air settles thick and steamy aboard the 24-foot *Privateer*, *Yankee Dave*. "Sharpnose," yells Capt. Dave Beresoff as he disentangles a dead Atlantic sharpnose shark from the net.

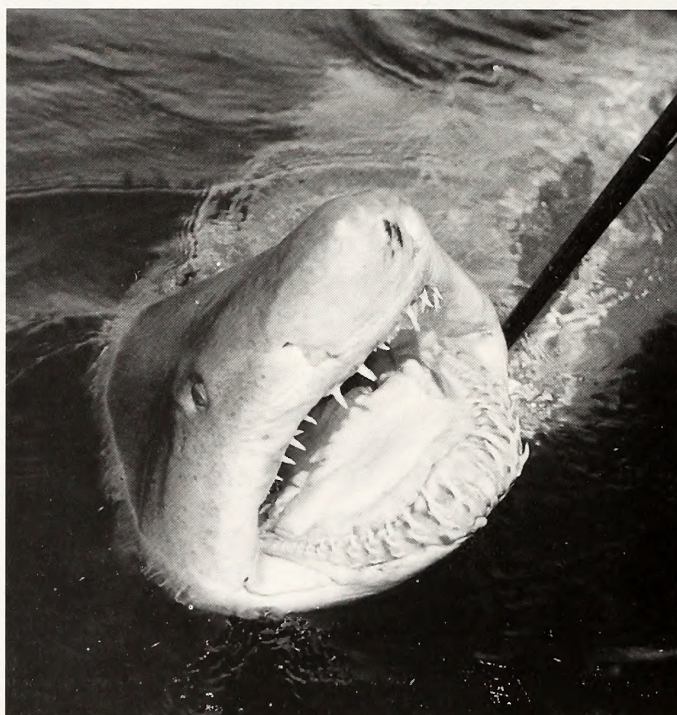
Half a mile off Holden Beach, Beresoff and his 15-year-old son, Jeremy, are doing something other commercial fishers aren't allowed to do — reeling in nets set to catch sharks.

Strict regulations now prohibit sharks from being commercially targeted within the three-mile limits of state waters. Generally, most other shark catches are restricted to one per trip per day. Just two days earlier, Beresoff's catch included two large tiger sharks — one seven feet, and the other nearly 10 feet long.

But Beresoff isn't breaking the law. He's conducting research funded by the North Carolina Fishery Resource Grant (FRG) program. Several times a week, he heads out with Teresa Thorpe, a biologist from UNC-Wilmington, and UNC-W marine biology student Rebecca Popovec.

Tossing the small shark toward the back of the boat, Beresoff continues pulling in nets with Jeremy.

Meanwhile Thorpe stands poised with



Sharks of all sizes are found in North Carolina waters, including this sand tiger.

a sharp knife as she examines a dead bonnethead shark. Unfazed by the gentle waves endlessly rocking the boat, Thorpe makes a surgically precise incision down the shark's midsection. The cut reveals the shark's two uteruses, each containing several small embryos.

Thorpe calls out technical data to Tara Nye, substituting today for Popovec, who meticulously records each fact. Length, stomach contents and anything that might tell the tale of the life and habits of a particular shark are recorded. Live sharks

are tagged and released.

Thorpe pauses before discarding the remains of the pregnant shark overboard. "It makes me sad somehow," she says.

But that's why they're here. Thorpe and Beresoff are investigating ways to keep such sharks out of commercial gill nets.

In a previous FRG study, Beresoff and Thorpe tried using different mesh sizes to reduce shark bycatch. Finding that sharks often become entangled rather than "gilled," they now want to see if making nets more rigid will prevent inadvertent shark catch.

Today's catch of 22 sharks is relatively low — five bonnetheads, 16

Atlantic sharpnose and a three-foot blacktip. Most of the catch is dead when brought on deck. As free-swimming fish, Thorpe says, sharks die quickly once entangled in nets.

But even though most are dead, regulations say nearly all must be thrown back, something Beresoff decries as a waste of a resource.

As a former member of the N.C. Marine Fisheries Commission, Beresoff cites a need for accurate evaluations of species abundance in order to devise fair management plans.

From his commercial fishing experience, he knows also that sharks frequently damage or destroy costly nets. Yet, he says it's impossible to "go out into this great abyss and stay away from them."

A buoy marking the last net to be reeled in has been moved a long way from its original placement. Beresoff says this means there could be something big in there. As he pulls it in, however, he finds a large hole in the net and a partially eaten fish. Something big just took a bite and kept going, he says.

SHARK STUDIES

The FRG program was created in 1994 by the North Carolina legislature to allow people who work on the water or in fishery-related businesses to test their ideas about preserving coastal resources.

Perhaps no one has more at stake in protecting fish species from depletion than those who fish for a living. Of their research, Thorpe says the idea is "to find ways that are good for fishermen and also preserve the species." Several FRG projects concern sharks.

Why sharks? Several shark bite incidents this year have made the public aware of what commercial fishers have known for some time — there are a lot of sharks off the North Carolina coast. Well over 40 species of sharks can be found here. For many, this elicits both fascination and fear.

Twenty-five years ago Peter Benchley's *Jaws* gnawed its way into the national subconscious leaving in its wake such stuff as nightmares are made of. With eyes open, however, we find sharks are more often the victims of humans.

In fact, the market for sharks is so great that biologists fear some species are in danger of depletion — and the loss of

Several shark bite incidents this year have made the public aware of what commercial fishers have known for some time — there are a lot of sharks off the North Carolina coast. Well over 40 species of sharks can be found here. For many, this elicits both fascination and fear.



Atlantic sharpnose sharks are frequently caught in fishing nets.

any species is a disruption to the ecosystem. Some might say, we have met *Jaws*, and *Jaws* is us.

The issue is complicated. Anecdotal evidence from commercial fishers seems to contradict concerns of fishery regulatory agencies about shark abundance.

It's a contradiction that leads to distrust and resentment between regulators and the regulated. It seems accurate population counts could be one of the mysteries of the deep.

Robert Fournier Jr., director of

husbandry at the New Jersey State Aquarium, said in a 1999 *New York Times* article: "We are not against fishing or harvesting seafood, but we want reasonable regulations — and you cannot have that without having information about the fish. In a lot of cases, right now, regulations are based on guesswork."

Even among fishery management councils, questions about shark populations are contentious.

Earlier this year the Mid-Atlantic and New England Fisheries Management Councils — which have joint jurisdiction that includes North Carolina — tried to agree upon fishing quotas for the spiny dogfish. That fishery brings in about \$10 million annually in North Carolina, according to N.C. Division of Marine Fisheries (DMF) statistics.

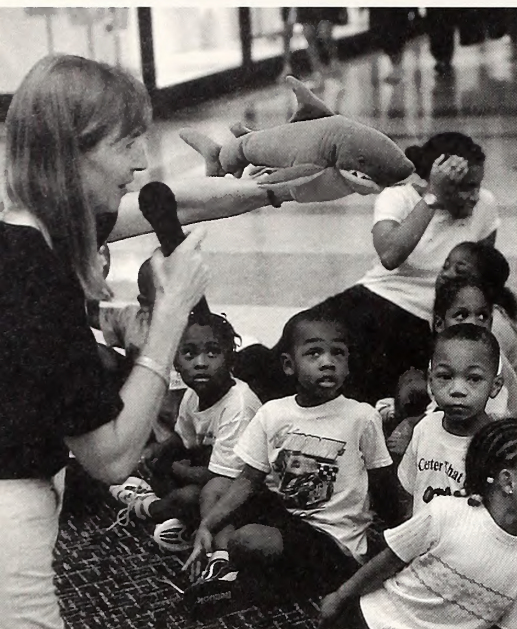
The plan stalled when the mid-Atlantic council recommended a 2.9 million-pound yearly limit on spiny dogfish, while the New England council felt a 14 million-pound limit was adequate. Then-U.S. Commerce Secretary William Daley settled the dispute with a yearly quota of 4.5 million pounds, according to Chris Batsavage,

DMF lead biologist for spiny dogfish.

Batsavage says the quota discrepancies may be more a disagreement about management than about the severity of the depletion of the species. Nevertheless, the disagreement underscores the need for accurate population profiles. But it's not just overall numbers that matter.

In a previous FRG study, Beresoff and Thorpe found the southeastern coastal region to be a nursery for several shark species, including the Atlantic sharpnose,

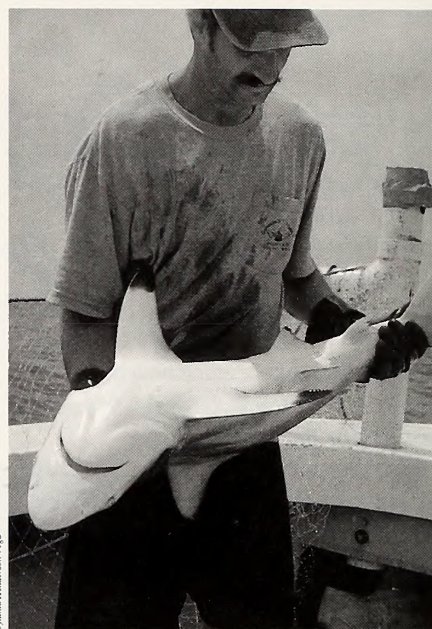
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These Raleigh youngsters want to know more about sharks from Lundie Spence.



Shark specimens displayed at Crabtree Valley Mall attract tentative touches.



Capt. Dave Beresoff shows a shark caught during this study.

spinner, blacknose and, less frequently, the blacktip and scalloped hammerhead sharks.

This has special implications for fishery management, since overharvesting of juveniles and females of reproductive age can rapidly deplete a species.

MIGRATION PATTERNS

Also of concern are migration patterns of different species. Roger Rulifson, professor of biology at East Carolina University, works with commercial fishers T. Edward Newman Jr. and Chris Hickman on separate FRG projects looking at migratory and biological aspects of the spiny dogfish.

According to a report by Rulifson, commercial fishers "are concerned that ... the spiny dogfish may not be able to sustain heavy fishing pressure in this region."

Supply simply cannot keep up with demand. Rulifson says that one market for the spiny dogfish is the fish and chips industry in Great Britain.

Thorpe, who is from southern England, says the English know the spiny dogfish as rock salmon or grey fish. She says with a smile, "Sounds a lot better, doesn't it?"

Whatever its name, the spiny dogfish

ends up far from home. Some spiny dogfish tagged off the North Carolina coast in Rulifson's studies had tags returned from as far away as Germany and Italy. Strange migration patterns? No, says Rulifson. The spiny dogfish didn't swim there: They were imported, and the tags were returned by food processors.

Chris Hickman, one of Rulifson's co-researchers, says there may be a stock of spiny dogfish off the North Carolina coast separate from that of New England. If proved true, management plans should reflect this.

Management should encompass more than regulations on commercial fishers, Hickman adds. He blames over-development and alteration of wetlands as having adverse effects on water quality, which also contributes to depletion of fish stocks.

Hickman agrees that we "need basic management in all species," but wants to see more scientists and fishers working together in regulatory matters.

Glenn Hopkins is busy fishing for large coastal sharks like sandbars, blacktips and bulls in federal waters beyond the three-mile state limit. He says he is satisfied that management plans can be and, in some

cases, are effective. His FRG study focuses on shark bycatch in the Spanish mackerel and king mackerel sinknet fishery.

Hopkins shares the idea that management must be based "strictly on science." In the large coastal shark fishery, he says, "the United States is doing a good job." Since a management plan went into effect in 1993, he reports seeing a steady increase in the availability of large coastal sharks.

Closer to shore, Beresoff and Thorpe finish up the day's shark expedition. When "Captain Dave," aka "the shark guy" brings the *Yankee Dave* in to dock, he is met by a small but curious crowd.

Basking in local fame, Beresoff welcomes the chance to share his research, which he hopes will bring an understanding of commercial fishing to the public and contribute to the data that guide fishery management.

"A lot of us live in tune with the ocean," he says, "and we're not going to exploit it." ▣

For more information on the Fishery Resource Grant Program, check the Web at www.ncsu.edu/seagrant or call North Carolina Sea Grant at 919/515-2454.

Fall: A Season for Discovery

By Pam Smith

Soon, days will grow shorter and autumn will nudge temperatures down a notch or two. But there's no need to abandon a vacation frame of mind. Fact is, North Carolina's coast has year-round natural treasures to enjoy.

A host of new books can lead readers to exciting destinations for a long weekend or a post-Labor Day week at the coast. Some are meant to guide you to and through places that reflect the unique coastal history, culture and environment.

• **Exploring North Carolina's Natural Areas: Parks, Nature Preserves, and Hiking Trails**, edited by Dirk Frankenberg, *The University of North Carolina Press*, Chapel Hill, NC 27515. 432 pages. Paperback, \$18.95, ISBN 0-7078-4851-4. Hardcover, \$29.95, ISBN 08078-2547-6.

This collection of "eco tours" was Dirk Frankenberg's final gift to the people of North Carolina before his untimely death in June. Dedicated to the state's citizens, the book showcases the variety of natural areas accessible to the public from the coast to the mountains.

Frankenberg, who was a highly respected professor of marine sciences at the University of North Carolina at Chapel Hill, called upon leading naturalists from across the state to author "tours" as a public service. Essays highlight the ecology, geology, biology and natural history of sites in each region to give readers a

glimpse of the state's rich biodiversity.

In his introduction, Frankenberg tells readers that the book is meant to acquaint people with North Carolina's environmental heritage by directing them to the best-preserved examples of natural landscape.

Along with editing, coordinating and organizing this terrific resource book, Frankenberg contributed several entries, including five coastal tours to: maritime forests, Bogue Banks, a blackwater river, the lower Cape Fear River, and a

Brunswick County savanna. He also guides an adventure into the Great Smoky Mountains National Park.

Some entries have strong Sea Grant ties. Lundie Spence, education specialist, and B.J. Copeland, former director, collaborated on "Albemarle-Pamlico Peninsula: Pocosin Lakes and Wetlands." This sector of the coastal plain encompasses Pocosin Lake National Wildlife Refuge, Pettigrew State Park, Somerset Place, Phelps Lake, Alligator Lake and Lake Mattamuskeet. The authors show "how water and land interact to form wetlands, lakes and water courses that have sustained wildlife and humans for thousands of years."

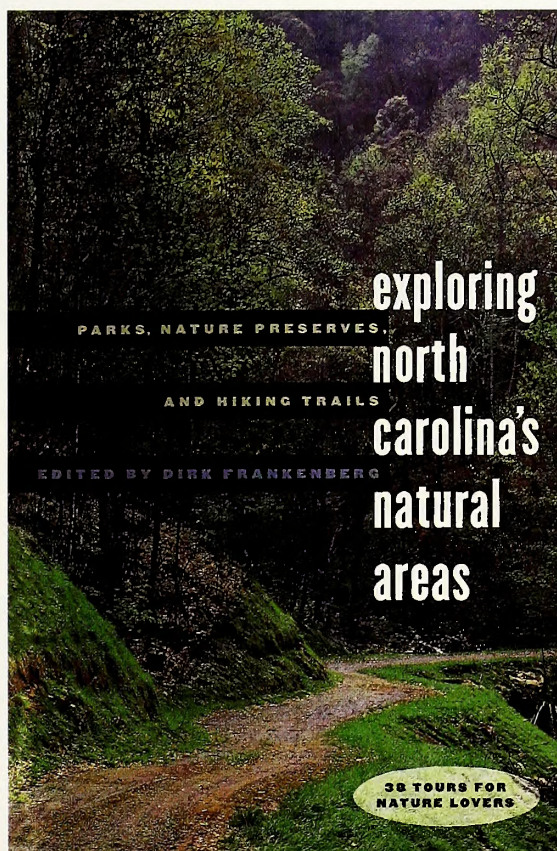
Illustrations and maps with each entry make this book an excellent resource for planning nature trips. Readers will want to take a copy along to refer to

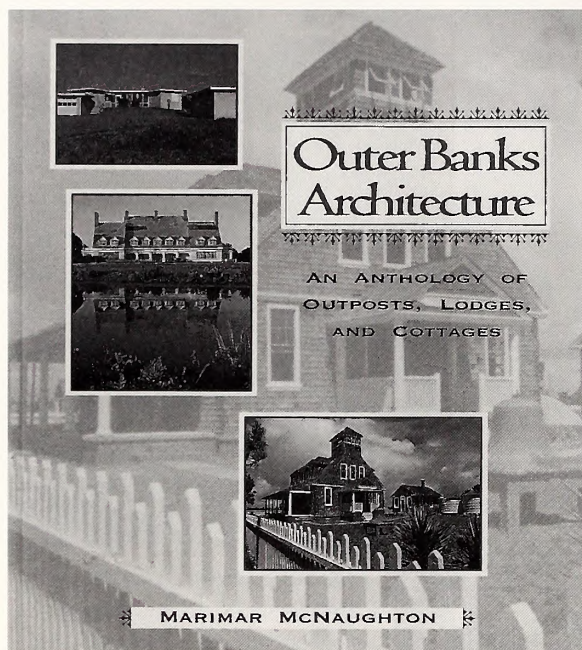
authors' descriptions of what can be seen and learned along the way and notations of unique features — hiking trails, bike trails and water courses.

Soon, school children across the state will be able to take virtual field trips to each of 38 destinations by clicking on the multimedia listing on the Learn NC Web site, www.learnnc.org.

Frankenberg's legacy includes earlier books, *The Nature of the Outer Banks*

Continued





Outer Banks today and rediscover the barrier islands as they were from the 1800s to the 1950s," McNaughton writes in the introduction.

Not surprisingly, lighthouses, lighthouse keepers' houses and lifesaving stations are among the oldest structures on the Outer Banks. Less apparent is the fact that the earliest keepers' houses were built from materials left over from the lighthouse construction.

Perhaps even more of a surprise is the fact that hunting and shooting clubs appeared on the landscape almost as early as the

lighthouses. The Currituck Shooting Club, described as "Spartan," is the oldest active hunt club in North America — its membership dates to 1857.

Corolla's Whalehead Club is a more lavish retreat. As McNaughton tells the story, it was built in 1925 by Edward Collings Knight Jr. on the site of the much earlier Lighthouse Club. The story goes that Knight wanted to create a new club for his second wife, an accomplished hunter, who had been denied entry to the local all-male hunt clubs.

"These retreats started a trend — one that continues today — in which large gatherings of people of means come to the Banks for a limited season of sport and pleasure," she writes.

Other vacationers came to escape the threat of malaria. These families came from the Albemarle region after the Civil War — planters, their wives and

children, friends, neighbors, cooks and maids — to establish the *first* Old Nags Head on the Roanoke Sound. "Nothing of that original colony survives on its original site today," the author says. Gone are the bath house, post office and general store. But some believe that one or two of those cottages may have survived to become part of a *second* Old Nags Head Cottage Row. Located along the oceanfront, these wood-frame, cedar-shingled homes are now on the National Historic Register.

McNaughton concludes with a "tour" of Southern Shores, the first planned community on the Outer Banks. After World War II, when lumber was restricted for government use, developer Frank Stick created the "Flat Top" single story, block cottages made of sand mined from local beaches then cast into 42 pound cement blocks. The first, built in 1947, remains today along with a handful of others from that period.

The book is fun to read and a definite

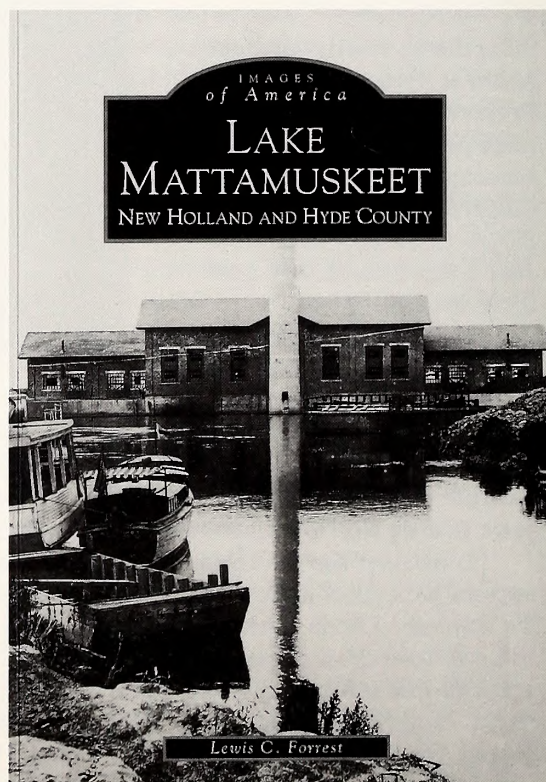
(1995) and *The Nature of North Carolina's Southern Coast* (1997), both from UNC Press.

• **Outer Banks Architecture: An Anthology of Outposts, Lodges, and Cottages**, by Miramar McNaughton, John F. Blair, Publisher, Wintson-Salem NC 27103. 114 pages. Paperback, \$14.95, ISBN 0-89587-192-0.

To give readers a sense of people and place, Miramar McNaughton presents the history of the Outer Banks through its architecture. The author shows that necessity influences form, and structures support lifestyles.

The book highlights structures that have been preserved or restored and remain visible to the public — ranging from simple to lavish and representing a variety of native architectural styles. The lively narrative is full of "behind the scenes" insight that is often humorous and always interesting.

"Using this book as a guide, it is possible for newcomers and old-timers to peel away the excessive commercial and residential development evident on the



“take along” for a fall weekend on the Outer Banks.

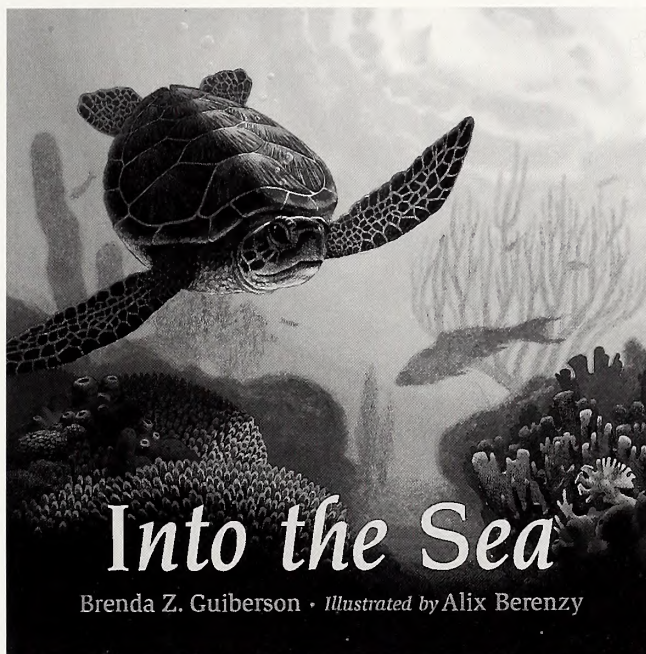
• **Lake Mattamuskeet: New Holland and Hyde County**, by Lewis C. Forrest, The Arcadia Publishing Company, Charleston, SC 29401. 128 pages. Paperback, \$18.99, ISBN0-7385-0771-5.

Lake Mattamuskeet — North Carolina’s largest natural freshwater lake — is the subject of both science and legend. In his new book, Lewis C. Forrest tells a little of both to underscore the lake’s role in history, culture, economy and ecology.

Forrest, executive director of The Mattamuskeet Foundation, has devoted thousands of volunteer hours researching the lake’s history. Drawing on a collection of more than 36,000 pages of historical documents and period photographs, Forrest focuses on 1909 to 1934 — a period when the lake was drained by the Mattamuskeet Drainage District in an attempt to claim its bed for agricultural and residential use.

The project attracted the attention of engineers from across America and abroad, and led to the construction of huge floating dipper dredges to excavate the canals, the introduction of the railroad, and the creation of the world’s largest pumping plant — now Mattamuskeet Lodge. The project changed hands several times. In 1926, pumps drained the lake a third and final time.

The drainage project ended with the sale of the lake to the U.S. government in 1934, when it became known as the Mattamuskeet Migratory Waterfowl Refuge. The Civilian Conservation Corps (CCC), a work program during the Great Depression, converted the old pumping plant into the lodge and observation tower. The building served as a hunting lodge until 1974 and was placed on the National Historic Registry in 1980. The lodge now is



a field station for East Carolina University and the Partnership for the Sounds.

Today, the lake makes up most of the Mattamuskeet National Wildlife Refuge and is a favorite wintering spot for migratory birds on the Atlantic Flyway. Thousands of tundra swan winter on the 50,000-acre lake — a phenomenon marked each year with the celebration of Swan Days on the first weekend of December. The book is a must for those attending this event, scheduled for Dec. 2-3. (See Coastal Tidings.)

• **Into the Sea** by Brenda Z. Guiberson, illustrated by Alix Berenzy. Henry Holt and Company, Inc., 115 West 18th Street, New York, NY 10011. 30 pages. Hardcover, \$15.95 ISBN 0-8050-2263-5.

This book about sea turtles is listed as juvenile literature. But the story and the illustrations are so compelling, adults will find it irresistible. Simply put, *Into the Sea* follows the life journey of a sea turtle from its hatching on a moonlit beach, through its years in the sea, and its return to land to lay its eggs. The turtle’s survival skills are tested as she encounters colorful — and

often threatening — creatures in the vast ocean environment.

Through an accurate portrayal of this endangered animal, readers learn about the beauty and pitfalls of life at sea, and the role instinct plays in guiding the behavior of this sea giant. Guiberson writes:

“At three hundred pounds, the turtle is a fully grown adult. Soon eggs begin to form in her body, and she finds a current that seems familiar to her and follows it back across the ocean.”

After more than 20 years in the sea, the turtle has returned to land. Waiting until nighttime, she pulls her body across the sandy beach, and works to exhaustion to prepare

a sandy chamber for her eggs — about one hundred of them.

And then, in words and pictures, the reader witnesses the cycle repeating itself: “She leaves the sandy nest behind her. If nothing destroys the eggs, her babies will hatch in two months. Perhaps one or two will get past the crabs and the sea birds, the fish and the fishing nets, and like their mother, will return to lay eggs on the same sandy beach before making their way back into the sea.”

Youngsters will want to keep *Into the Sea* on their shelves for a long time. It is a blend of a good read, good science and good art.

North Carolina beaches are nesting sites for leatherback, loggerhead and green turtles. Nest sites are marked by the National Park Service rangers and other conservationists to protect them from human intervention. Some beach areas may be closed at times when hatchlings are attempting to reach the ocean. The Network for Endangered Sea Turtles (NEST) keeps track of daily sea turtle activity for all North Carolina beaches. Observations may be reported by calling 252/441-8622. □



*"It appeared much more comfortable, to be under the open canopy of heaven,
and the protection of Providence, though among the wild beasts,
than among those of the human race."*

– Catharine Phillips

The Lamb's Army

By David Cecelski

In 1753, an English missionary named Catharine Phillips passed through some of the most remote swamps and forests along the North Carolina coast. She was only 27 years old, 3,000 miles from home, and among strangers.

Six years earlier, she had received the call to preach at a Quaker meeting in her native Dudley, in Worcestershire. "Having now entered the list of publick combatants in the Lamb's army," she wrote, "I pretty soon became concerned to travel for the promotion of truth and righteousness."

Published in London in 1797, *Memories of the Life of Catharine Phillips* is one of the rarest of the many journals, diaries, and memoirs penned by missionaries who evangelized in the Carolina tidewater during the late 17th and early 18th centuries. Quaker missionary William Edmundson, who proselytized along the coast in 1671, may have been the first such writer. In his journal, he described remote forests that were "all wilderness [with] no English inhabitants or pathways" and that had only "marked trees to guide people."

Fuming at earthly pleasures in the colony's bedraggled, rum-soaked little ports and backcountry villages, few of those early ministers and lay preachers could boast much success in the soul-saving way. The colony eventually attracted a variety of religious outcasts and dissenters — Quakers, Baptists, and Moravians among them — but overall, few tidewater people joined churches or looked for evangelical preaching in colonial days.

But if they rarely drew large crowds to their makeshift altars, these itinerant preachers still left priceless troves of documents

chronicling the colonial landscape, a world of vast longleaf pine forests, uncharted pocosins, and great cypress and juniper swamps. The missionaries' accounts, like Phillips's *Memories*, also reveal much about the colonists' spiritual outlook toward what to them was a strange, new land.

Catharine Phillips was unusual among the exhorters and evangelists. It was, after all, a day when women did not travel by themselves and were rarely allowed to preach in public; often, they were excluded even from praying aloud in their own churches. At one point, while visiting a Friends meeting along the Perquimans River, Phillips humbly acknowledged that the novelty of an itinerant woman preacher might explain her drawing power. "No women-ministers had visited part of this country before us," she wrote, "so that the people were probably excited by curiosity."

Yet a woman missionary like Phillips may not have been an altogether rare sight, at least not in 1753. The Quakers had always held that God's "inner light" could be found equally in every person, and they did not discourage women from becoming "public preachers," as the Religious Society of Friends called its missionaries. Phillips came from a Quaker family. Her father, a paralytic by the time she left home in 1748, had been a Quaker missionary. In North Carolina, she found a sizable Quaker community that was at least respectful toward her.

The Quakers were not the only sect in which large numbers of women became religious leaders during the First Great Awakening, as the religious revivals that swept the colonies in the 1730s and 1740s are

Continued

A HISTORIAN'S COAST

collectively known. Women also played leadership roles in the New Light, Separate, and Baptist faiths — all evangelical, dissenting churches. The pattern was repeated by the Freewill Baptists, the Methodists, and other evangelical faiths during the Second Great Awakening a half-century later.

The hardships of travel were a constant lament in colonial writings by missionaries, man or woman. As early as 1672, the great Quaker missionary George Fox described the North Carolina coastal plains as being “pretty full of great bogs and swamps; so that we were commonly wet to the knees, and lay abroad a-nights in the woods by a fire.”

Until the Tuscarora War of 1711-13, English missionaries often felt threatened by the native Algonquian, Siouan, and Iroquoian peoples as well. On his second visit to North Carolina, in 1676, George Edmundson preached in the vicinity of the Great Dismal Swamp, where he found “perillous travel[ing] for the Indians were not subdued. ... Scarce any durst travel that way unarmed.” His use of the word *wilderness* to describe lands where native peoples had villages gives insight into the way many missionaries saw coastal Indians. The natives, too, were part of a wilderness in need of “civilization.”

Travel had not improved much for missionaries by the time Catharine Phillips arrived in America. After disembarking in Charleston, S.C., in late October 1753, Phillips and a companion, Mary Peisley, followed the Pee Dee River toward a Quaker settlement at Haw River, in Alamance County, N.C. After riding all day through a dark, lonely forest, the women and their guides made camp by a swamp. They slept under “a little shed of the branches of pine-trees, on a rising sandy ground, which abounded with lofty pines.”

Many English missionaries found the colonial back country strange and threatening. Villages were a rare sight, and travel through the dense forests and ubiquitous swamps was slow. Something about the great forests cast long shadows in colonial travelers’ minds. They looked with revulsion at the desolate backcountry and the pitch makers, trappers, and dirt farmers who lived there. “You don’t



On the shores of Great Lake, now part of Croatan National Forest

Photo courtesy of G.A. Nicholl Photo Album, New Bern-Craven County Library

know gloominess until you travel through that country,” a woman named Mary Harper Beall wrote years later, making almost a moral judgment against the colony’s great stretches of woods and wetlands.

The indictment was harsher yet among high-minded preachers, who looked at tidewater wild places as a dangerous sanctuary for fugitive slaves and for Indians who had outlasted the Tuscarora War. At times, they preached as if clearing forests and draining swamps were a holy crusade blessed by God, as much a part of colonizing America as thwarting the French and the Indians.

They likewise associated the deep forests and coastal swamps with a whole host of European outcasts who had taken refuge in the colony: criminals, debtors, women who had fled their marriages, indentured servants who had escaped bondage in other colonies. In 1711, a frustrated Anglican minister, John Urmston, lambasted the Carolina colonists as former convicts from English prisons, then called them “the most notorious profligates upon earth.” Many itinerant ministers, especially Anglicans, seemed to find the colony’s untamed landscape somehow symbolic of those dissenters and pariahs. They compared the countryside unfavorably with

England, where game wardens maintained the forests as hunting parks and poachers risked the death penalty.

Armed with that moral righteousness, many colonial evangelists saw the devil’s stomping grounds in the longleaf pine glades and blackwater swamps. From their pulpits, they exhorted against the dark, unruly forces of the wilderness. They taught children to treat the woods as an asylum for evil spirits and witches.

The Rev. Ruben Ross long recalled how he had learned to fear the forest dwellers near his home in Williamston. “We village people could tell a witch as far as we could see one, as we thought,” he told his son and biographer. “When they came to town, they always appeared in the form of little old women, with bright scarlet cloaks and hoods drawn over the head.”

Catharine Phillips shared little of the moral-tinged fear of the wilderness so prevalent among her evangelical brethren. She seemed a peaceful soul even that first night camping by a swamp: “We made a large fire, and it being a calm, fair, moon-light night, we spent it cheerfully, though we slept but little.”

Not that the coastal wilderness never tested her faith. Phillips often slept in cold, damp lodgings, if not outdoors. One winter day,



The shore of Lake Ellis (Craven County) circa 1925

Photo courtesy of G.A. Nicholl Photo Album, New Bern-Craven County Library

she fell backward into the water while crossing a swamp on the way to a Quaker meeting in Bladen County. She was frightened by stories that a panther had recently killed a traveler in what was probably the Green Swamp, about 40 miles west of Wilmington. She also was startled by the barking of wolves near her camp. For another half-century, both of those predators still roamed the Green Swamp.

Phillips traveled to Alamance County, visiting Quaker meetings at New Garden, Eno River and other places, then rode all the way back to Bladen County and Wilmington. Then, on Jan. 20, 1754, she set out for the colony's largest Quaker settlements, which had been founded above Albemarle Sound in the 17th century. She traveled north through the ports of New Bern and Washington. "In this journey we met with considerable hardships," she remembered, "the people amongst whom we were being very poor, their houses cold, and provisions mean."

Arriving at the Perquimans River on Feb. 6, she preached at the Piney Woods meeting in Perquimans County and the Old Neck meeting in Pasquotank County. She also held prayer services, mainly for non-Quakers, in the villages of Edenton and Bath. Though

the counties north of Albemarle Sound were at that time the most densely settled in North Carolina, they still had few churches or ministers. In Bath, as in so many places she visited, Phillips found that "the life of religion was scarcely so much as known by many of [the residents]."

Bath, the colony's oldest town, was the scene of the two most unforgettable incidents in *Memories of the Life of Catharine Phillips*.

The first was the death of Rebecca Tombs, a "valuable friend" whom Phillips met at a Quaker meeting near the Perquimans River. Tombs volunteered to accompany Phillips to Bath. They crossed Albemarle Sound on a chilly day when "the frost was so hard, that the water . . . was frozen some distance from the shore." Tombs grew ill in the harsh weather as they rode another 43 miles along the edge of the East Dismal Swamp to Bath.

After preaching at the Bath courthouse, Tombs was "seized with an ague." Phillips "soon became apprehensive of her being removed by death." They headed back to the Perquimans River and sent a messenger ahead to alert Tombs's husband of her illness, but, in Phillips' words, "the Almighty did not see fit to continue her in pain." Rebecca Tombs died on

the morning of Feb. 20, 1754. Phillips had a coffin built and brought the corpse home to the Perquimans River, where a widower and seven motherless children waited.

Phillips did not pretend to be unaffected by the long journey across the East Dismal and Albemarle Sound with her new friend's corpse. Her native England was hardly a stranger to morbid illnesses and short lives, but Phillips never grew used to the high incidence of infectious diseases in colonial America and the often quick, fatal results. Faulting herself for allowing Tombs to accompany her to Bath, she confessed that sometimes, "like Jonah, I wished to die."

The second incident at Bath gives a sense of where the young English evangelist saw the root of evil, if not in longleaf glades or cypress swamps like so many of her countrymen. It was a relatively small affair concerning a slave girl, but it clearly made a lasting impression on Phillips. "One night a poor negro girl fell asleep at the top of the stairs, near our chamber door," she wrote, and the innkeeper, "seeing her there[,] kicked her down them." The innkeeper had "a dark ferocious disposition," she observed. "Indeed, darkness seemed to surround us in this house."

This incident brings to mind an earlier passage in Phillips's *Memories* when she was passing through the Green Swamp. Having failed to reach their destination at a remote inn, she and her party were forced to camp in a swampy tract renowned for its wolves, bears, and panthers. The next day, they breakfasted at the inn, where Phillips encountered "a wicked set of company, who had spent the night there."

Reticent about why she deemed the inn's guests so wicked, Phillips was nonetheless spurred by their behavior to contrast nature and humanity. Here, she turned upside down many preachers' views of the colonial landscape. Considering the inn's guests, she rejoiced that she and her fellow travelers had stayed in the swamp instead of the inn. "It appeared much more comfortable," she wrote, "to be under the open canopy of heaven, and the protection of Providence, though among the wild beasts, than among those of the human race." ■

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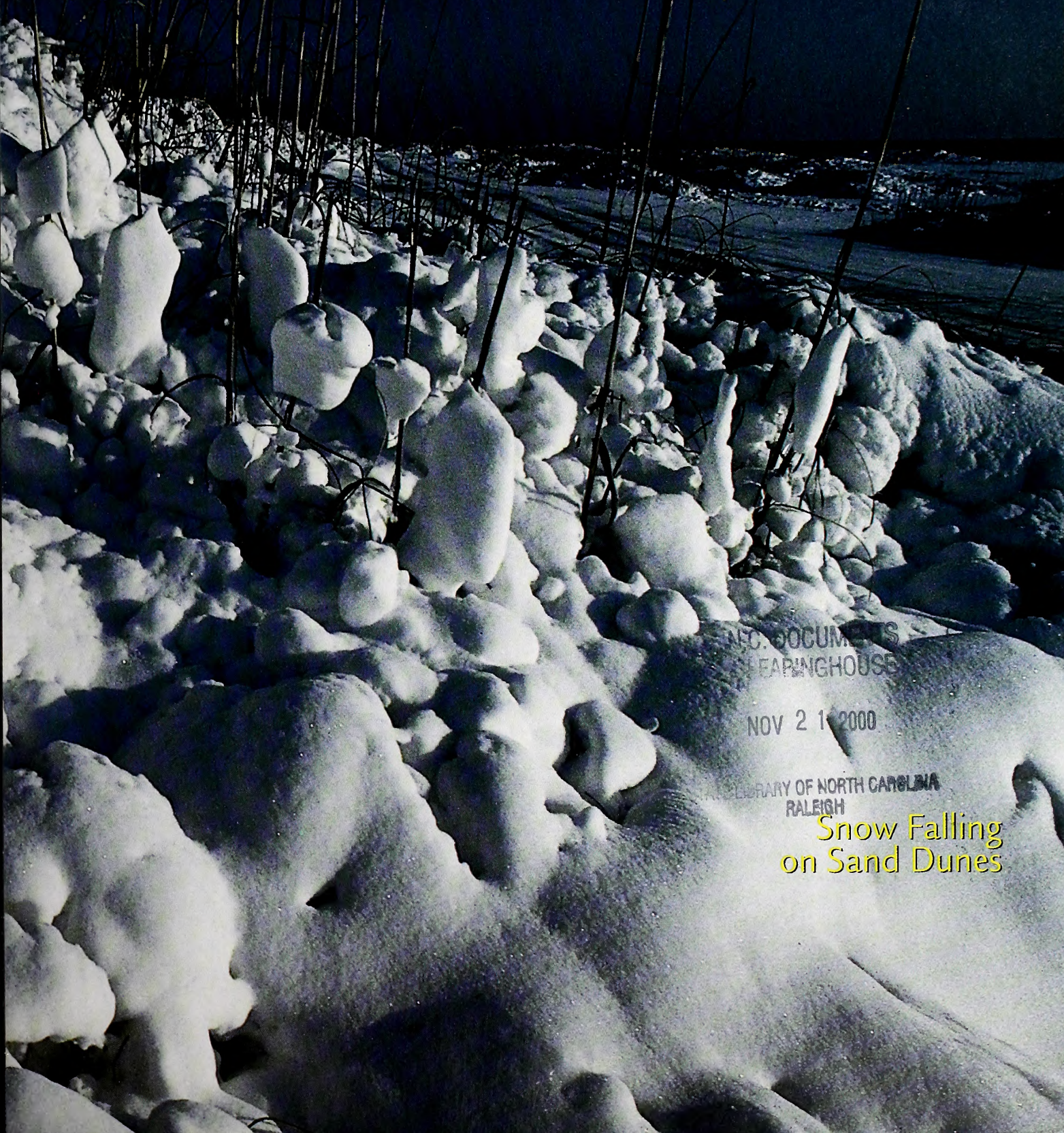
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Snow Falling
on Sand Dunes

Special Gifts

As this is the holiday season, I want to share the story of a special gift I recently received.

Frank Thomas, chairman of our North Carolina Sea Grant Outreach Advisory Board, pulled me aside at a meeting to say he had something for me. He and his wife, Rachel, had recently moved from their Raleigh home to a much smaller apartment and no longer had room for all their "treasures."

He offered a well-worn box chock full of wooden blocks. Each provided the heading for a section of the first seafood cookbooks published by the North Carolina State University Seafood Lab in the 1960s.

Each block has raised type identifying the category — such as shrimp, fish or oysters — and a simple illustration. Of course, the letters and art are set in reverse, to accommodate the printing process at the time.

Frank had been wise enough to save the blocks — from those "hot type" days — which otherwise may have wound up in a landfill.

I brought the box back to the gathering of Sea Grant staff and other advisory board members. My gift immediately became the center of attention.

Several folks kindly offered to keep the treasures if I did not have room. I politely declined their offers, planning instead to find a display box, leaving open the opportunity to use them again. I couldn't help but wonder if the zip disks containing our master version of this issue of *Coastwatch* will be as coveted in the year 2040?

While I enjoy the advanced communications available today — and look forward to new technologies in the future — I hope there always will be a place for the printed page that can be passed from generation to generation, without worry about changing technology.

I think that many *Coastwatch* readers would agree, based on comments that I have received while staffing various Sea Grant displays.

Some truly devoted readers have kept the past issues, back to the newsletter days in the 1980s, pulling one out from time to time to recall favorite stories. Such archives chronicle the changes along our coast — scientific, ecological and demographic, just to name a few.



Many readers whiz through each issue — from cover to cover, they tell me — then hand it off to friends, family or neighbors. Others bring past issues on their annual beach vacations and leave them in the cottage or condo for future visitors to enjoy.

While some folks may want to sit on the deck with a laptop, others don't mind the gentle ocean breeze rustling the pages of the magazine as they learn more about coastal resources.

So, as we cruise into the new millennium, we at Sea Grant often find ourselves using multiple formats — print, video and electronic — to present important information about the coast.

As the Internet — and now the wireless Internet — gains in importance, we continue to update our site on the World Wide Web —

www.ncsu.edu/seagrant.

For example, Barbara Doll, our water quality expert, developed a guide to recreational water quality that first was posted on the Web as the most immediate way to reach a large audience. We have printed 35,000 copies of our brochure on rip currents for distribution around the country — but a version of the brochure also can be downloaded and printed in your home or office.

At the same time, we must keep in mind our advisory board's caution not to limit our focus to one format.

Frank Thomas, founder of the seafood lab, received some of the initial Sea Grant funding in North Carolina. As we approach our 25th anniversary as a Sea Grant College Program, he and others on the advisory board will help us to recognize our heritage and target our future efforts. Check back here — and on our Web site — for updates on the anniversary celebration.

In the meantime, if you have memories of Sea Grant's past efforts, or suggestions for future directions, please drop me a note. We now have a comment card along with the subscription cards in the center of the magazine — or you can zip off an e-mail to kmosher@unity.ncsu.edu.

Thanks in advance for your memories and musings. They are gifts indeed.

Katie Mosher, Managing Editor

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Front cover photo of snowy dune
and table of contents photo
of snowy beach
by Michael Halminski.
Printed on recycled paper. ♻️

COASTAL TIDINGS



Scott D. Taylor

Do Go Near the Water

Clean water is essential to vacationers as well as recreational water-dependent businesses in eastern North Carolina.

Thanks to Barbara Doll, Sea Grant water quality specialist, there's a Web site designed to help determine if it is safe to drink the water, eat the seafood, or go for a swim at your vacation destination.

Click on www.ncsu.edu/seagrant and go to *Recreational Water Use and Human Health: A Fact Sheet for Coastal Vacationers and Water-Dependent Businesses*.

Doll collaborated with experts from several state agencies to compile this "go to" source of critical information. It is designed to help vacationers and recreational managers make informed decisions about the

risks associated with recreational water exposure in local areas.

The online document addresses frequently asked questions about water quality, offers a glossary of terms, and includes Web sites for additional information. Presented in user-friendly question and answer form, it focuses on the three main areas of recreational water contact and human health: microbial pathogens; harmful algae; and toxic contaminants.

The good news is that North Carolina officials maintain ongoing monitoring programs for rivers, estuaries and ocean waters. And that, overall, recreational water quality along the coast is considered excellent.

— P.S.

In the Next Issue of *Coastwatch*

Pam Smith continues to examine coastal water issues, including wastewater disposal and the implementation of the next phase of federal stormwater management rules. She'll also look at the state's Cape Fear River Basinwide Water Quality Plan. Meanwhile, Ann Green takes readers on a tour of the diverse wetlands at Goose Creek State Park.

Leatherbacks Hatch on Hatteras



Photo by Michael Hahn

A leatherback turtle nest in Hatteras Village — one of four such nests sited on our coast this year — had 83 hatchlings burrow out of the sand and head to the sea this summer.

Another three stragglers were found and released after the nest was excavated a few days later. The nest originally had held 99 eggs.

"It's exciting," says Marcia Lyons, a field biologist with the National Park Service.

The endangered leatherback is the largest sea turtle. Named for their soft backs, rather than hard turtle shells, adult leatherbacks average more than six feet long and weigh about 1,400 pounds.

Lyons and Ruth Boettcher, the state's sea turtle project coordinator, suspect that the nests, laid about 10 days apart, were from the same female — and likely the same leatherback that nested in North Carolina in 1998, resulting in three "crawls."

This year, two nests also were laid on Ocracoke. One failed, and the other had no sign of hatchling movement by mid-September. A fourth nest, at Cape Lookout, also failed.

The Hatteras nest was of interest to tourists all summer. Despite regular monitoring, most of the original 83 hatchlings made it out without human witness. The last one was rescued from a ghost crab by a volunteer and sent out to sea.

"We had no idea how many days to expect because we are so far out of the normal range," says Lyons. The closest established nesting areas for leatherbacks are in Florida.

The 1998 nests were considered a record for the northernmost location for a successful nest. Prior to that, hatchlings were seen on Portsmouth Island in the 1960s, but a nest was never documented.

A variety of organizations up and down the North Carolina coast monitor sea turtle activity, most often loggerhead turtles nesting. If you would like to volunteer, contact Boettcher, at 252/729-1359 for more information.

— K.M.



Scott D. Taylor

Commercial Fishing Show Moves to New Bern

Want to see the latest in fishing gear or technology?

Then set your course to the 21st Annual North Carolina Commercial Fishing Show to be held Feb. 24-25. In 2001, the show moves to the new Riverfront Convention Center in downtown New Bern.

Sponsored by the North Carolina Fisheries Association (NCFA), the show will feature a variety of vendors showing the latest gear, engines and generators, packaging, electronics, refrigeration, and foul weather gear and boots.

North Carolina Sea Grant will be among the educational booths. Also look for special programs for kids.

For more information, contact the NCFA at 252/633-2288. Online, check www.ncfish.org.

— K.M.

Keeping Tabs on the Neuse

Researchers at North Carolina State University's Center for Applied Aquatic Ecology are using automated sensing and sampling devices to collect and analyze water and weather conditions along the Neuse River.

Led by JoAnn Burkholder, North Carolina State University professor of aquatic botany and marine sciences, the project will help scientists, state agencies and the public keep tabs on fish kills, algae buildup, nutrient levels and other water-quality problems in the estuary.

Four of the projected 15 monitoring platforms are operating in the Neuse at New Bern, Kennel Beach, Carolina Pines and Cherry Point. Hourly data transmitted to NC State are posted directly on the center's Web site at www.pfiesteria.org. The information will remain on the site for a week and then be archived at the lab.

Burkholder, a Sea Grant researcher, says the ongoing monitoring of meteorological and hydrological conditions will help scientists better understand what combination of factors leads to *Pfiesteria* outbreaks and other fish kills. Stored data could be used to create computer models to enable scientists to predict where and when such events are likely to occur. — P.S.

Blue Crab Landings Down in 2000

Preliminary reports point to a disappointing commercial blue crab harvest for the 2000 season — this, after record landings in 1999.

Although the official tally by the N.C. Division of Marine Fisheries won't be available for several months, anecdotal evidence suggests many commercial operations struggled to stay afloat.

In mid-July, several processors in Beaufort and Pamlico counties reported working at half to three-quarters capacity. By September, many picking houses were operating only two to four days a week. Commercial crabbers were calling it a dismal season.

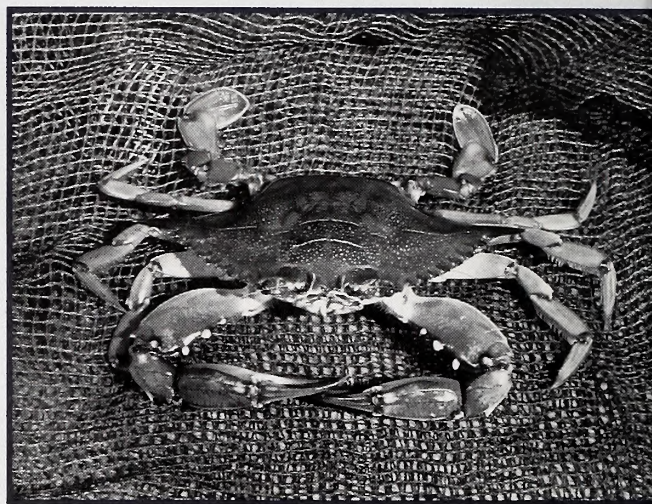
But Dave Eggleston isn't surprised that landings were down from last year, especially in the Neuse. Eggleston, a Sea Grant researcher at North Carolina State University who studies blue crabs, says, "The long-term data on blue crab abundance is notoriously variable in the Neuse River, where it can vary four- to ten-fold between years."

What caused this year's decline is subject to speculation, says Larry B. Crowder, professor of marine science at the Duke University Marine Lab in Beaufort. The effects of flooding — low oxygen due to

nutrient loading and low salinity from the freshwater deluge — are among the probable culprits.

"There are reasonable arguments for poor survival by one-year-old crabs from 1999 into two-year-old, legal-sized crabs this spring," Crowder adds. This could be due to spawners in poor condition or failure of larvae to recruit back into the estuary which was flooded with freshwater throughout the fall of 1999.

Crowder says it is important to continue to monitor fishery effects, especially in the Neuse River and Pamlico Sound. Statewide landing figures could mask effects that were more regional due to flooding. — P.S.



Landing Science

Undersea Program Lauded

The National Wildlife Conservation Society presented its 2000 Conservation Award to Aquarius and the University of North Carolina at Wilmington's National Undersea Research Center (NURC) last month. The award cited "the role played by Aquarius and the NURC in helping unravel the mysteries of the ocean by placing scientists underwater to conduct their studies."

Aquarius is the only underwater laboratory operating in the world's oceans and is located adjacent to a coral reef in the Florida Key's National Marine Sanctuary. Funding for Aquarius and NURC is provided by the National Oceanic and Atmospheric Administration (NOAA).

The UNC-W undergraduate marine biology program is ranked fifth in the nation out of 150. For information about Aquarius, visit the Web site: www.uncwil.edu/aquarius. — P.S.

Study Finds Seafood Not Harmed by *Pfiesteria*

North Carolina Sea Grant scientists have found that seafood exposed to *Pfiesteria* is safe for consumers to eat.

In a three-year study of fish from the New and Neuse rivers in Eastern North Carolina, researchers found no link between harmful effects of *Pfiesteria* — a tiny marine organism associated with fish kills and health problems in those who work the waters — and seafood consumption.

"There is no evidence supporting the uptake of potentially toxic substances from *Pfiesteria*," says North Carolina Sea Grant researcher Dave Green, who is an associate professor of food science at North Carolina State University and director of the Center for Marine Sciences and Technology in Morehead City. "Our studies found no harmful link between

fish exposed to potentially toxic compounds produced by *Pfiesteria* and the edible tissues of seafood."

Green collaborated on the study with NC State toxicologist Patricia McClellan-Green, NC State veterinary immunologist Edward Noga, and former NC State graduate research assistant Erica Balmer Hanchey.

The Sea Grant researchers sampled edible tissues from nonexposed fish and fish environmentally exposed to *Pfiesteria*, including menhaden, southern flounder, spot, croaker, mullet and bluefish. "The only species found to have a toxic effect was menhaden — primarily menhaden with open sores," says McClellan-Green, adjunct research assistant professor at Duke University Marine Lab. — A.G.



Big Sweep 2000 Sets Record

North Carolina Big Sweep 2000 had a record number of volunteers at this year's cleanup.

In September, 14,789 volunteers scoured North Carolina's beaches, sounds and waterways, beating out the previous 1997 record of 14,456 volunteers.

"We are excited about the record number of volunteers," says Big Sweep president Judy Bolin. "The weather was perfect. More people are accepting their responsibility to take care of North Carolina's waterways."

The volunteers in 100 North Carolina counties picked up more than 257 tons of trash — from shopping carts and motor parts to a baby pool and diapers.

Big Sweep was launched in 1987 by North Carolina Sea Grant marine education specialist Lundie Spence. The first year saw 1,000 volunteers gather 14 tons of trash.

For general information about Big Sweep 2001, contact the state headquarters at 919/404-1600. — A.G.

Celebrate Paddling in North Carolina



In North Carolina, you can navigate more than 1,200 miles of coastal paddling trails.

Celebrate paddling these waterways and learn more about the potential of the state's coastal ecotourism at Coastal Plain Waters 2001. The three-day event will be held from March 30 to April 1 in Washington.

Hosted by the North Carolina

Coastal Plains Paddling Initiative (NCCPPI), the conference includes paddling field trips, academic presentations and panels of experts from business and government.

The conference is sponsored by Confluence Watersports Company, North Carolina Sea Grant, Partnership for the Sounds, N.C. Division of Parks and Recreation, North Carolina State University's Department of Parks, Recreation and Tourism Management, and the Mid-East Resource Conservation and Development Council, Inc.

Registration forms are available on the Web: www.coastalwaters2001.ecu.edu/. For more information, contact Lundie Spence, 919/515-3012, lundie_spence@ncsu.edu, or Chris Siderelis, 919/515-1700, chris_siderelis@ncsu.edu. — A.G.



Dreaming of a White Winter

By Pam Smith

ABOVE & RIGHT:

A winter storm on Hatteras Island transforms the Chicamacomico Lifesaving Station into a snowy wonderland.

If you think that a white Christmas on the Outer Banks is unusual, you haven't been around as long as Ignatius Doyle Midgett — I.D. to friends. "An Easter Sunday snowfall in 1939 was the heaviest I can ever recall," he says.

Midgett was about eight years old at the time of the holiday event. "Easter must have come early that year," he explains. "We had all just been to church when it began snowing. By night, we were snowed in. It was not a blizzard, but one of those gentle, quiet snowfalls. The snowflakes were the size of silver dollars."

Normal day-to-day activities were put on hold until the snow melted in a day or so. "We had no sleds, but we found other ways to enjoy the snow while it lasted," Midgett says.

A snowstorm in 1946 also stands out in his mind. "My father was on leave from the Coast Guard Station at Chicamacomico. We plowed through the snow to hunt geese and ducks."

Midgett, a retired ferry captain, says his adult winter memories are not so fond. He reports that, "Everything pretty much stops with Nor'easters. They can blow the water out of the sounds and pile it up as ice along the opposite shore."

That's how 82-year-old Roy White of Knotts Island remembers it in Currituck County as well.

C o n t i n u e d



Michael Hammond



Scott D. Taylor

As a youngster, White worked with his father as a hunting guide. “My daddy operated Pud White’s Hunting Club from 1922 until 1948. I can remember having to break through the ice to get to the duck blinds,” White recalls. “At times, the bay would freeze so hard that we had to put skids under the boats.”

As for snow, he remembers a storm in 1937 that dumped about two feet of snow on the island. The wind piled it into drifts above his head. “We had no sleds or skis. We just put boards under our feet and slid around,” he recalls.

Residents in isolated communities such as Knotts Island had to be self-sufficient, White says. “When I was a youngster, my family prepared for hard winters. There were 11 of us children and no supermarkets to run to. My father would slaughter eight or ten hogs and put them up in the smokehouse. My mother always canned all kinds of vegetables and made preserves. Potatoes were stored in a root cellar lined with straw. That’s how we got through the winter.”

White says in his adult years he weathered many a tough winter season — with or without snow. Before retiring in 1978, he tended about 300 eel pots for six months every year, and net fished the other months.

“Any amount of snow in eastern North Carolina is a lot of snow,” says Ryan P. Boyles, assistant state climatologist.

And snowfall records from a series of weather-reporting stations indicate that residents in coastal communities have had their share of the white stuff — at least one major snowstorm in each decade of the past half century.

C o n t i n u e d





In 1989, they even enjoyed the proverbial “White Christmas” when a surprise winter storm slipped up from the Gulf of Mexico bringing an accumulation of 12 to 18 inches from Southport to Currituck.

Not as pleasant in the memory books was the February 1973 storm that was described in a *Wilmington Morning Star* story as “the heaviest winter blast since 1896, crippling the eastern part of the state with a foot of snow.” High winds and record tides buckled the Johnny Mercer Pier at Wrightsville Beach and devoured miles of beaches all along the coast.

And, in March 1980, a headline stretching across the front page of the Wilmington paper announced “Rare Blizzard Covers Dixie,” telling of a snowstorm that “shut down all essential activities in the region.” The snow began to fall late on Sunday, March 2. By Monday, the paper said, Wilmington was a “ghost port shrouded in snow.”

Indeed, records of that storm from the State Climate Office at North Carolina State University confirm accumulations of about 18 inches of snow in most coastal towns and inland to Bayboro and Greenville. Elizabeth City recorded a whopping 25 inches of snow.

But some *Coastwatch* readers’ winter tales reach back further than climate office data.

“You know, winters must have been a lot colder in the old days,” says Knotts Island octogenarian White. “My daddy used to tell stories about the Currituck Sound freezing solid over back in 1899. People drove horse and buggies across to Currituck.”

Now that’s cold. ❏



WOMEN ANGLERS SHOW COMPETITIVE EDGE

By Ann Green • Photos by Scott D. Taylor

As I head out of Beaufort Inlet into the Atlantic Ocean with three veteran women anglers, captain Elizabeth Dixon warns me the ride could get rough.

She's right. Each time we hit a wave, I hold on to the back rail and bend my knees for balance. It feels like being on a roller coaster or wet ride at a water park. I grip the rail tightly and hope I won't fall down.

As we get farther into the Atlantic, I get sprayed a couple of times with splashing waves, and my hat blows off my head.

When we reach the targeted fishing area 15 miles off Beaufort Inlet, the Atlantic is almost 70 feet deep. Dixon expresses concern because no fish are showing up on the depth recorder, a device that monitors the ocean bottom and sends images of fish.

"We need one 20-pound fish to place," says Dixon. "We need to keep anything decent. With a southeast wind, we may not catch anything."

This is the fifth consecutive year Dixon and her crew, Michele Cameron and Sarah Frances Dixon, have fished together in the Carteret County Sportsfishing Association (CCSA) Ladies King, Spanish, Dolphin Rodeo.

"This tournament is as competitive as any king mackerel tournament," says Skip Conklin, president of the CCSA. "The ladies are as capable as the men of catching big fish. The tournament gives them an opportunity to demonstrate their assertiveness in fishing."

TOURNAMENT RECORDS

Across the country, more women are competing. Both Elizabeth Dixon and Cameron fish side by side with their husbands in Southern Kingfish Association (SKA) fishing tournaments. In 1999, Cameron set a SKA record, becoming the first woman to catch a king mackerel over 60 pounds.

"When Elizabeth and I started tournament fishing in 1994, we were among the few women on the fishing circuit," says Cameron,

an art teacher in Craven County. "Only a few tournaments had lady prizes. Now 90 percent of fishing tournaments have lady prizes."

Another North Carolinian also holds a tournament record. In 1993, Kathy Keel of Edenton set an all-time record in the Big Rock Blue Marlin tournament in Morehead City when she landed a 795-pound blue marlin.

"It took Keel only 20 minutes to get the fish to the boat," according to the Big Rock Blue Marlin Tournament Web site. "Some fights last more than five hours."

Carol Marsh, an outdoor columnist for the *Wilmington Star-News*, attributes the rise in competitive women anglers to the increased interest in outdoor activities.

"You are seeing more outdoors programs on television," says Marsh. "As the world becomes more computerized, people want to get outside more. It is nice to take your fishing rod and go somewhere."

Others attribute the increasing popularity of women's competitions to more families fishing together.

"Fishing is a great sport," says Jack Holmes, president of SKA in St. Augustine, Fla. "It is something the whole family can participate in. Technically speaking, women make better anglers. They use more finesse in catching fish."

In North Carolina, there are several women's fishing tournaments besides the CCSA. They include the Long Bay Lady Anglers King Mackerel Tournament on Oak Island and the one-day Jarrett Bay Lady Angler Tournament, which is a part of the Big Rock Blue Marlin Tournament in Morehead City and requires anglers to release all catch.

One of North Carolina's largest women's angler tournaments is the Alice Kelly

Continued

Captain Elizabeth Dixon, right, and pal

Sarah Frances Dixon venture into the Atlantic for a women's fishing tournament.





*Elizabeth Dixon casts her line
into the rough waters of the Atlantic.*



Memorial Ladies Only Billfish Tournament in Manteo. Sponsored by Pirate's Cove, the Kelly tournament raises money for the Outer Banks Cancer Support Group.

The tournament has grown from 23 boats in 1990, its first year, to 90 boats in 2000, according to Heather Maxwell, the tournament director.

"There are a lot of competitive lady anglers on the tournament circuit," says Maxwell. "This is more of a fun fishing tournament. It is a great introduction to the sport."

ANGLERS' SURVEY COMPARES WOMEN TO MEN

To find out if women have different reasons for entering tournaments than men, North Carolina Sea Grant acting extension director Jack Thigpen and Texas A&M University recreational fishing researcher Robert Ditton conducted a survey. They compared women anglers in the Alice Kelly tournament to their male counterparts in the Pirate's Cove Annual Tournament in Manteo.

Although tough competitors, the women also were motivated to enter tournaments because of social factors such as "being outdoors" and "family recreation," says Thigpen. In contrast, men were more likely to cite technical reasons, including catching trophy fish and developing fishing skills.

"These results show definite gender differences between women and men in reasons for entering fishing tournaments," says Thigpen. "The women are just not emulating men when they compete."

As more women take the helm of sportfishing boats, boat manufacturers are redesigning recreational boats to accommo-

date women — from less visible marine heads or toilets to more storage space.

"As the baby boomers get into the height of their earning years, they are recreating more with their families," says Eddie Smith, CEO of Grady White Boats in Greenville. About 10 years ago, we saw a trend toward more and more families fishing. We incorporated more opportunities for enclosures for marine heads. We also have incorporated more seating into fishing boats."

ENDURANCE REQUIRED

To get a behind-the-scenes look at women anglers, I ride with Dixon and her crew during the first day of the CCSA Ladies King, Spanish, Dolphin Rodeo.

My first fishing tournament trip begins when it is still pitch black. I meet Dixon and her husband Gary Unger at their Cartaret County home. They have been up for a while stocking the boat and checking the fishing lines.

I load my food and drinks into their boat. Then I drive to the private boat dock near their home where I jump onto the red and blue-striped center console boat and meet the other women anglers.

The three women on board are long-time pals. The tournament is a chance for them to catch up on friends and family.

"It's the girls' weekend," says Elizabeth Dixon. "This is a big treat to fish together. We all grew up playing on the water."

Before the boat leaves the pier, Unger jumps on board to help catch bait. Tournament rules allow him to stay on the boat until 7 a.m. Then he has to leave because the anglers are entered in the all ladies' category. In other categories, men can stay on the boat but

cannot catch any fish.

As we head into Bogue Sound, Elizabeth Dixon warns me that they are not fishing near the shoals because the weather might be rough.

"During a tournament, we go out no matter what the weather is like," she says. "I have fished during Hurricane Felix and also during a tornado warning."

Two boats follow us as we try to catch bait in the middle of Bogue Sound near Atlantic Beach. As the sun begins to rise, it casts a pink haze on the aqua blue water.

"Catching bait is one of the hardest parts of fishing," says Cameron. "Sometimes it can take hours to catch bait."

Fortunately, we hit a pool of menhaden. After pulling in the net, Dixon scoops out about 50 silver menhaden and puts them into a container.

"Now that we have got the fresh bait, it will be a piece of cake," says Dixon. After catching the bait, Unger and his black Labrador retriever, Trader, jump onto another boat. Now it's up to the women to pull in the big ones.

Because of tournament time limits for catching fish, Dixon speeds up as we head into the Atlantic. Within 15 minutes, the boat is at the targeted fishing site.

Cameron, who is wearing a gold king mackerel necklace, idles the engine back. We wait in the hot, muggy air until a fish tugs on the line.

I feel a little queasy as the boat continues to rock and wonder if I can endure the whole day on the water. I eat some crackers, drink a Coke and try to concentrate on the horizon instead of the ocean to prevent seasickness.



From left, Michele Cameron, Elizabeth Dixon and Sarah Frances Dixon hold up a prize-winning, 27.3-pound kingfish.

PATIENCE, FINESSE NEEDED

For the anglers, this tournament is a chance to show their fishing finesse and athletic prowess.

Dressed in a baseball cap, shorts and top, Dixon climbs above the rods and puts menhaden bait on a double-pogie rig.

"Elizabeth is very athletic," says Cameron. "Not many women on the circuit can work the fishing lines."

While they wait for fish to bite, the women swap fishing stories and bask in the hot sun. One person continually monitors the depth recorder to see where the fish are.

"Bring the lines around," yells Elizabeth Dixon. "I think we have something."

She reels in a small baby cobia.

"We may not catch a lot because it was a full moon last night," says Cameron.

As two to three-foot waves crash against the boat, Elizabeth Dixon yells that she hears a zing or grating sound of a king mackerel on the lines. "Go girls. We got something," she says.

With the boat swaying in the waves, Cameron, a petite woman with sparkling blue eyes, rushes to the back of the boat. She moves to the side, leans back and slowly reels in a small king mackerel.

Each time the women catch something, I stand behind the captain's chair. The women are strictly following the tournament rules, which don't allow noncompetitors to get close to the fish. Jumping from one boat to another also is prohibited.

A few minutes later, there is another tug on the line. The women let Sarah Dixon, a single mother from Snow Hill, pull this one in.

After finessing the line for more than 20 minutes, she pulls in a large kingfish. The

women use a gaff to pull the fish onboard. As the fish hits the floor, its silver mouth bobs. The fish measures 45 inches.

"It was fun to get the fish," says Dixon. "But it was also work wearing the fish out. This is probably the only time I will fish this year."

After being on the water for several hours, I am beginning to feel comfortable. I delight in seeing women work so hard to catch fish.

STORM CLOUDS MOVE IN

A few minutes later, tournament director Eddie Cameron, a Carteret County contractor and Michele Cameron's husband, radios the women about a storm heading from the southeast.

"It is better to stay out in the water," says Cameron. "You might head right into the storm."

As the black clouds begin to roll in, we take down the rods and put on our rain gear. We also radio friends who are still in the Atlantic and head down the beach to meet them.

To get away from the storm, Dixon speeds up and heads away from the clouds. I hang on to the rails. As we head toward Swansboro, my knees start shaking. A couple of times, I feel like I am going to lose my balance and even ask the captain to stop the boat.

We stop in the middle of the ocean where I regain my composure, taking a deep breath and wiping off my sweaty hands. With no boats in sight, I decide to sit on a container near the side where I get a thorough soaking.

Throughout the long ride, we only come close to one boat. However, we never find the friends' boat.

As the captain navigates through the rain with a global position system (GPS) — a satellite system — I move once again to a seat next to the captain where I feel more secure the next time a wave smacks the boat.

I begin to relax when I see the "no wake" sign in Beaufort Inlet.

As we pull into the dock, Elizabeth Dixon, who had remained calm at the helm, admits that storms scare her.

"I am afraid of lightning," she says. "Last weekend, we got in a storm. Part of being a veteran angler is making sound and quick decisions."

After we pull into the dock, the women relax for an hour. They weigh in the kingfish at 27.3 pounds.

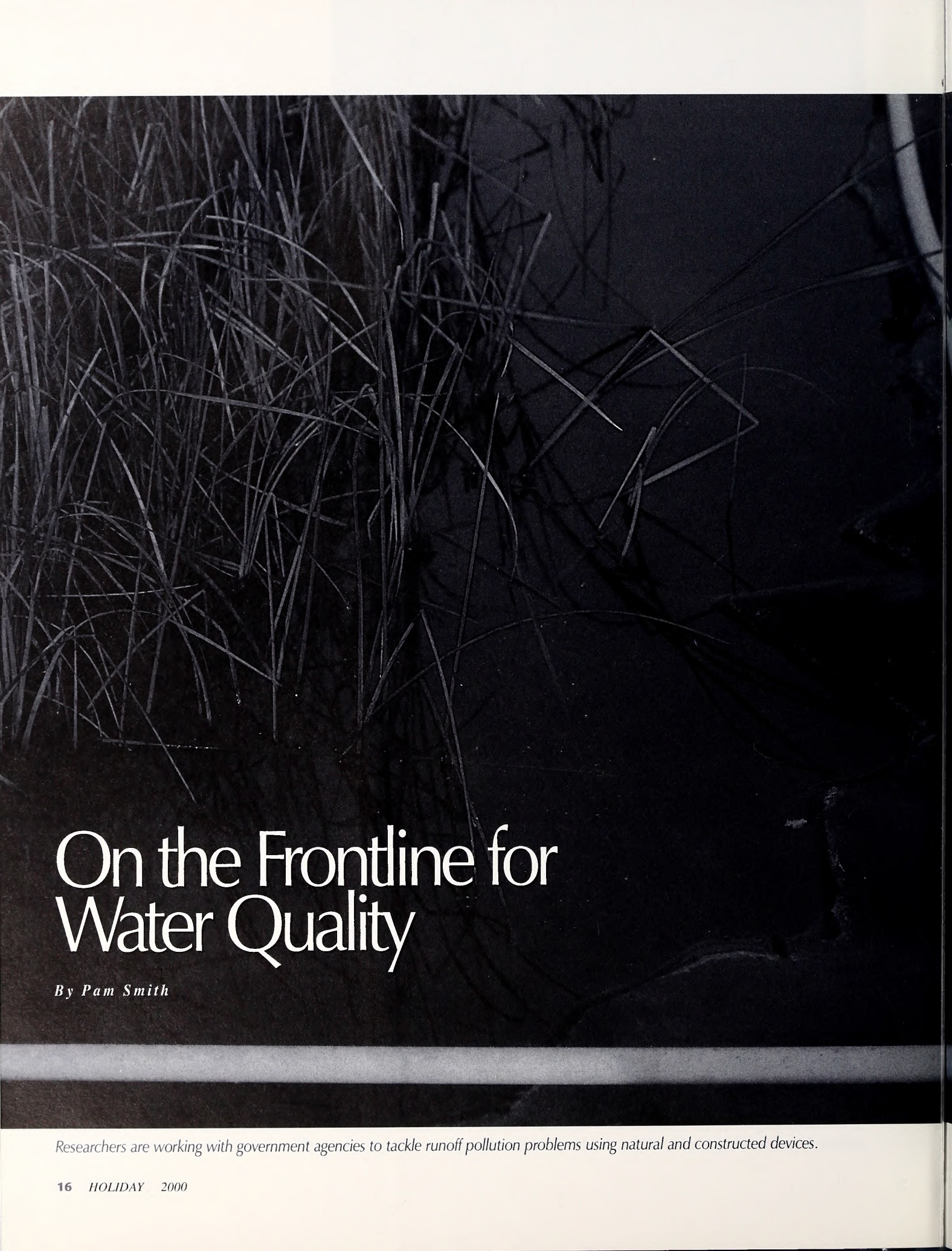
The next day, they find out they have won first place and a \$4,000 prize.

"It was great winning the tournament," says Elizabeth Dixon. "This was the first time that an all ladies' boat has won the ladies' tournament."

However, Elizabeth Dixon, who has won a couple of boats in tournaments, says you don't turn a profit with prize money.

"Every cent goes back into maintaining a boat," she says. ■

The North Carolina Wildlife Resources Commission's Division of Conservation Education offers fishing classes at its Becoming An Outdoors-Woman (BOW) workshops. In addition, women can learn saltwater fishing techniques at the Beyond BOW workshops. For information on workshops locations and dates, call Cheryl West, 919/733-7123, ext. 269 or visit the Web: www.wildlife.state.nc.us/ConservationEd/ and follow the links to N.C. Wild and workshops.



On the Frontline for Water Quality

By Pam Smith

Researchers are working with government agencies to tackle runoff pollution problems using natural and constructed devices.



Katie Mosher

Earth. The water planet. Oceans, bays, sounds, rivers, streams, artesian springs. Each offering life-giving abundance. Each seen as an unending resource.

Scientists tell us that the water on Earth today was present billions of years ago and will continue to renew itself through the hydrologic cycle. Most of us can recall the illustration in an elementary school science book showing precipitation falling — some seeping into the ground, some running into rivers, and flowing to the oceans. Then the water heats, evaporates and enters the atmosphere as gas, only to condense and fall again in some form of precipitation.

The astronomical amount of water on earth may equal prehistoric times, but what about water quality? What besides two parts hydrogen and one part oxygen is flowing into the groundwater and washing into rivers and oceans? What is the precipitation absorbing from the atmosphere as it falls to Earth?

The answer to both questions, of course, is pollution. Ultimately most pollution ends up in coastal waters. And from time to time it manifests itself dramatically in reports of fish kills, closed shellfish beds and recreational areas, or alarming “dead zones” in offshore waters. These red flags raise public awareness and often become catalysts for policy action.

Federal and State Mandates

In 1972, Congress enacted the Clean Water Act in response to public concern that many of the nation’s waters were in trouble and wetlands were disappearing at a rapid rate.

According to Walter Clark, North Carolina Sea Grant’s legal and policy specialist, “The Clean Water Act laid the foundation for how we manage our nation’s waters and wetlands. It provided a framework to address causes of pollution, including municipal and industrial wastewater; to control runoff from urban and rural areas; and to protect wetlands and other aquatic habitat.”

The act developed a permit program for point source pollution — discharge from industry or wastewater plants. In 1987, an amendment addressed nonpoint pollution sources — runoff from pavements, rooftops, crops, lawns and golf courses. The U.S. Environmental Protection Agency (EPA) monitors and sets basic criteria, and states are responsible for implementation.

Importantly, the Air Pollution Prevention and Control Act of 1977 recognized that air pollution has a significant impact on water quality through atmospheric deposition of various compounds, including toxins and nutrients. According to the National Research Council, if the proposed EPA standards were implemented, atmospherically deposited nitrogen compounds would drop as much as 17 percent in certain estuaries.

The Coastal Zone Management Act of 1972 is seen as more enabling than regulatory. It established a partnership between federal and state governments for managing the coast — states adopt policies that meet national objectives, and

C o n t i n u e d



Katie Mosher



TOP: Wetlands protect water quality by filtering harmful pollutants from runoff before the water enters streams and coastal waters.

BOTTOM: This constructed wetland project at a New Hanover County landfill effectively reduced harmful runoff pollutants. The county has expanded the operation as a permanent pollution prevention practice.

federal agencies provide funds for approved state programs that protect environmentally sensitive and economically important coastal resources.

North Carolina and Sea Grant have been an integral part of the quest for sustainable water quality for more than two decades. In 1974, the EPA gave North Carolina authority to implement its own water quality program based on the federal legislation. Today a host of state agencies

under the Department of Environment and Natural Resources and the Department of Health and Human Services oversee programs that play critical roles in achieving statewide water quality.

North Carolina also enacted the Coastal Area Management Act in 1974, establishing the Coastal Resources Commission to manage development activity along the coast. In addition, the Division of

Marine Fisheries and its commission, oversee marine and estuarine fisheries.

The North Carolina Sea Grant College Program was established in 1976 to carry out the national program's mission to promote the wise use of marine and coastal resources through education, research and extension.

Scene Set for Action

The groundwork is in place to get the job done, says Barbara Doll, Sea Grant water quality specialist. Doll has been preaching the water quality gospel since the earliest days of her career with Sea Grant. That's when she launched a campaign to promote awareness that whatever is dumped into the neighborhood storm drain affects water quality in that particular river basin. She organized teams to stencil the name of the receiving water basin on hundreds of storm drain covers — a practice imitated as far away as Hawaii.

As a Sea Grant specialist, Doll collaborates with other Sea Grant extension specialists, university researchers, North Carolina Cooperative Extension, the NC State Water Quality Group and a number of state agencies to conduct water quality workshops across the state.

In recent years, North Carolina adopted a basinwide approach to water quality planning, developing maps and pollution reduction goals for each of North Carolina's 17 river basins. Four are located entirely within North Carolina — the Chowan, Tar-Pamlico, Neuse and Cape Fear rivers flow into the Atlantic Ocean either directly or via estuaries and sounds.

Doll says basinwide management offers real possibilities for reducing nutrient runoff. Local stakeholders help select best management practices that are tailored to meet specific site or watershed needs. "Our estuaries and coastal waters can be the real benefactors of these improved management approaches," she says.

So it's good news for communities downstream when more than 200 professional planners and engineers turn out for a Triad workshop on urban water quality planning; when 200 professionals attend a mountain workshop on stream repair and

restoration; or when another 400 participants crowd a piedmont conference to learn about riparian buffers.

It's even better news when practices become policy in regions where rapid growth is stressing natural resources. Recently the piedmont town of Cary adopted a 100-foot riparian buffer rule to protect environmentally sensitive streams and lakes that drain into both the Cape Fear and Neuse river basins. The state's 50-foot stream buffer rule, expected to be approved in November, applies only to towns in the Neuse basin.

Riparian buffers include the land along creeks, rivers and lakes, Doll explains. They play a key role in stabilizing the stream banks and filtering sediments, nutrients pathogens and other pollutants from runoff. Stream buffers can be havens for wildlife or provide attractive recreational or educational space for communities.

Promoting Remedies

Bill Hunt, a member of the N.C. Cooperative Extension Neuse Education Team, is a recognized leader in promoting storm water management methods. Growth in North Carolina brings prosperity — along with paved surfaces and rooftops that replace naturally permeable soils. Pollutants carried by runoff include sediments from construction sites; oil, antifreeze and brake dust from parking lots and roads; and fertilizer and pesticides from lawns and gardens.

Hunt says homeowners can reduce the amount of pollutants entering waterways — from limiting fertilizer and pesticide applications to maintaining septic systems. Some of the large-scale pollution mitigation practices for developers to consider include constructed wetlands, sand filters, and bioretention areas or rain gardens:

- Constructed wetlands are shallow ponds with vegetation that remove pollutants through settling, and contain microbes that convert nitrate to harmless nitrogen gas.
- Sand filters treat runoff from impervious areas such as parking lots. This two-chambered system first slows the velocity of incoming water and then filters

Continued

Scott D. Taylor



Herman Lankford



TOP: Barbara Doll, Sea Grant water quality specialist, meets with David Pulley, Pine Valley Golf Course superintendent, to discuss one aspect of the ongoing stream repair project in Wilmington. The stream drains into the Hewletts Creek watershed. BOTTOM: Urban stream restoration is a critical part of improving coastal water quality. Rocky Branch on the NC State University campus drains to the Neuse River Basin.



Stormwater runoff is one of the main causes of untreated pollutants entering water bodies. Constructed wetlands can help achieve water quality goals.

out toxic materials through the sand.

- Bioretention areas and rain gardens typically are excavated areas filled with gravel, sand, an organic soil mixture and plants. The runoff is filtered through the sand and the vegetation takes up some of the nutrients.

Hunt has worked with the flood-prone city of Kinston on a project to demonstrate the effectiveness of using pervious materials for parking lot surfaces. The NC State stormwater specialist also has developed an on-line stormwater management course for planners and engineers in the Neuse River Basin. Access the site at www2.ncsu.edu/eos/info/bael/cont_ed for information.

One-by-One Improvements

Often awareness prompts voluntary response from private entities, such as an established New Hanover County golf course in the Cape Fear River Basin.

Doll is collaborating with colleagues from N.C. Cooperative Extension and the NC State Water Quality Group to design and implement a stream restoration and stabilization project for the Pine Valley Golf Course in Wilmington. The 800-foot

stream runs through the golf course and drains to the Hewletts Creek watershed.

The goal of the project is to demonstrate and evaluate best management practices for reducing nonpoint source pollutants entering the watershed from urban and recreational land uses. Doll will employ natural channel design techniques to restore the stream and reduce erosion. The floodplain will be widened to slow the water. A wetland will be constructed to provide some storm water retention and to increase habitat diversity. The banks of the stream will be planted with a mix of low-growing shrubs, grasses and trees. The county and state will share the cost of the \$87,000 project.

Challenges and Solutions

Water quality problems in Pamlico Sound probably are the most publicized in the region, if not the nation. From these waters, Sea Grant researchers JoAnn Burkholder and Ed Noga discovered the mysterious *Pfiesteria* — the microorganism believed to be responsible for numerous fish kills in the past decade. Its presence spurred state mandates to reduce nutrients believed to trigger the potentially toxic dinoflagellate.

It's a tall order, considering that the Neuse River water basin encompasses more than 6,000 square miles and is fed by 3,400 miles of streams and rivers — and considering that municipal water systems from the 17 counties along the river withdraw, use, treat and discharge millions of gallons from its flow each day.

No municipality is more aware of the challenge than New Bern — the last urban stop for upstream pollution before the river reaches the Pamlico Sound. New Bern officials teamed with geologists from East Carolina University and the N.C. Division of Water Quality (DWQ) to develop an innovative wastewater management solution.

Part I involves a major upgrade to its existing waste water treatment plant that could yield high-quality treated wastewater.

Part II is where it gets interesting. The

high-quality effluent would not be discharged directly into the Neuse River. Instead, it would be pumped into an abandoned Martin Marietta quarry. There, it would discharge slowly through the quarry floor into the limestone Castle Hayne aquifer.

Groundwater modeling that takes into account the underlying geology demonstrates that the water would then turn upward and discharge into the Neuse River and its tributaries from underneath. The goal is to allow natural filtration processes to remove nutrients — especially nitrogen — from the treated wastewater before it re-enters the Neuse.

From a regulatory perspective, says Kenneth Pohligh from the DWQ Construction Grants and Loans Section, this project represents the first of its kind in the state. Among other things, state permits would require the city of New Bern to collect hard data to substantiate nitrogen removal once the quarry disposal site is operational.

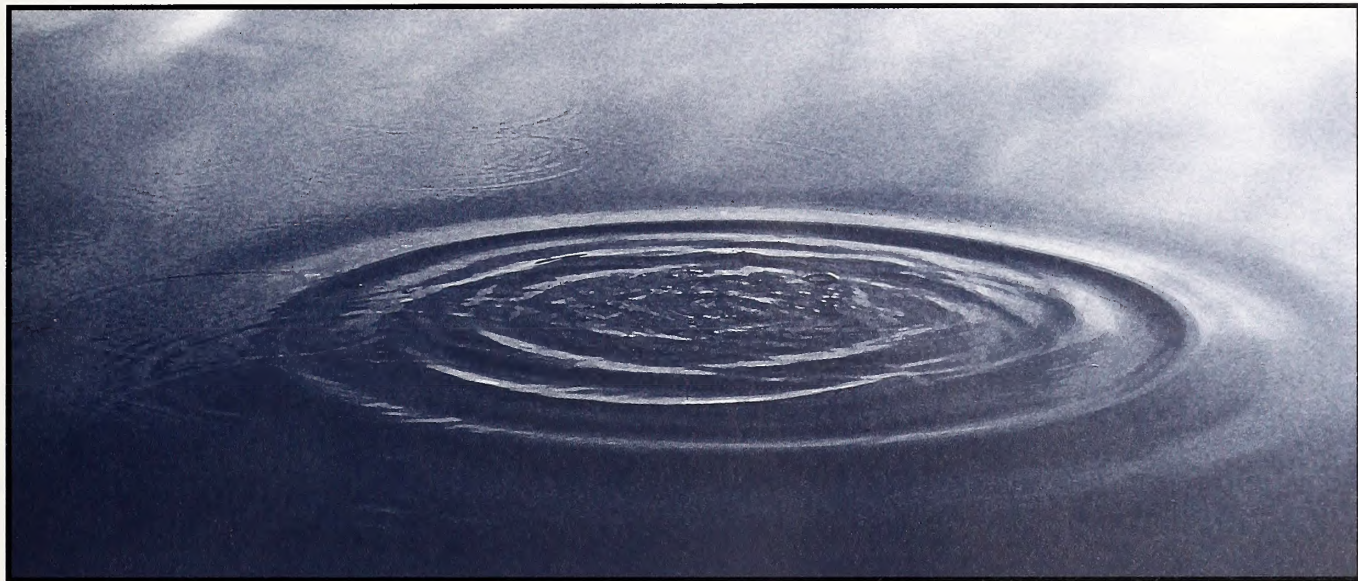
The upgrade for the city's treatment plant is expected to be completed by 2003. Until then, DWQ will continue to work with the city and researchers to work out details for the quarry storage project.

Promising Times

Sea Grant's Doll says, "These are promising times that offer possibilities to find science-based solutions to serious water quality problems. Partnerships with university, government and private entities will move us toward developing sustainable resources that will reap environmental and economic rewards."

For a look at some of the Sea Grant collaborative programs and projects fostering water quality, go to www.ncsu.edu/seagrant and click on Extension to reach "water quality" and "marine education" initiatives.

Want to know more about water quality issues? Check out the *Coastal Water Quality Handbook* written by Barbara Doll and Lundie Spence, Sea Grant marine education specialist (UNC-SG 97-04, \$6.) ■



Water, Water Everywhere

By Pam Smith

Water, water everywhere, but not a drop to drink. Or, so the saying goes.

To make certain that won't be the case in North Carolina, legislators, experts from the N.C. Department of Environment and Natural Resources, along with municipal water system operators and university scientists have spent more than a decade studying future water supply demands across the state.

In 1989 the General Assembly mandated a state and local water planning process to address major supply issues — and solutions.

The effort coalesced in January 2000 in the first draft of The State Water Supply Plan — the first document of its kind in North Carolina. The nonregulatory plan, based on local water supply assessments, is expected to be finalized in December.

Walter Clark, Sea Grant legal and policy specialist, says, "Long-range planning is critical in today's world of expanding growth. If we hope to protect

our natural resources, including water and open space, we must be proactive now. It will be difficult — if not impossible — to recover these vital resources once they are gone."

Nowhere in the state is water supply more critical than in the central coastal plain, where studies by the N.C. Division of Water Resources (DWR) indicate alarming declines in groundwater sources, especially the Upper Cape Fear and Black Creek aquifers. As a remedy, the agency recommends establishing a Central Coastal Plain Capacity Use Area for the 15-county region, which includes fast-growing Pitt, Lenoir, Craven and Onslow counties.

Capacity-use rules require those who take more than 100,000 gallons a day to apply for a special use permit and report water use rates to the state.

Municipal water systems in the region use dozens of deep wells to tap into the aquifers — layers of sand saturated with water and sealed in layers of clay. Dewatering of aquifers can permanently reduce an

aquifer's water storage capacity; result in the encroachment of salt water into fresh water portions of the aquifers; and contribute to sinkholes and depressed land areas.

To protect these aquifers and the dependability of supply, water withdrawals from the Upper Cape Fear and Black Creek aquifers have to be reduced. Under the proposed Central Coastal Plain Capacity Use Area Rules, some cities and other water users would be required to reduce withdrawals from these aquifers up to 75 percent over the next 16 years.

But before implementation, the proposed capacity-use rules first will be subject to rigorous review, beginning with the Environmental Management Commission in December. The rules also will be studied by a state legislative subcommittee for placement on the 2002 General Assembly agenda. If approved, the central coastal plain rules could be implemented by summer of 2002.

Continued

"Lack of water is a resource issue — we are overpumping these aquifers," says Don Rayno, DWR community planner. "The policy issue is how to wisely use the available water without depleting the resource while other water sources are developed. We can't wait until the well is dry to make those decisions."

Monitoring supplies of ground and surface water supplies is critical as demands increase with growth and development, Rayno says. Planning is essential for communities to map out alternative sources of supply.

NOT UNPRECEDENTED

Water resource planning is not a new concept in North Carolina. A prolonged drought in the 1950s led to the creation in 1955 of the State Board of Water Commissioners to study water policy. By 1960, several agencies were consolidated to form the Department of Water Resources. The Federal Resources Planning Act of 1965 provided grant money to encourage states to plan water and land resource use.

In the 1970s, the North Carolina Water Resources Framework Study inventoried water resources to facilitate community planning and use of water and land to meet statewide needs for the remainder of the century.

But it was the passage of the Water Use Act of 1967 that enabled the Environmental Management Commission to declare the first Capacity Use Area (CUA) and impose state control on water withdrawals. Its action stemmed from fears that groundwater use by a proposed phosphate mine (now PCS) in Beaufort County would deplete area wells.

The CUA designation, which remains in effect today, included Beaufort, Carteret, Craven, Pamlico and Washington counties. The proposed Capacity Use Area expands the boundaries to encompass Edgecombe, Duplin, Greene, Jones, Lenoir, Martin, Onslow, Pitt, Wayne and Wilson counties.

CREATIVE SOLUTIONS

Rayno says that an ongoing assessment and planning process is giving rise to creative solutions to water supply problems — and increased collaboration of local municipalities, state agencies, private engineering firms and university researchers.

Take for example the proposal by the Greenville Utilities Commission (GUC) to meet water supply needs by storing unused, treated drinking water drawn from the Tar River in a natural aquifer system to meet peak demands. GUC is allowed to draw two million gallons a day from groundwater (aquifers) and an additional 22.5 million from the Tar River, its surface water source.

The GUC consumption is about 18 million gallons on most days, says Richard Spruill, associate professor of geology at East Carolina University, who has been working on regional water supply issues for more than a decade.

"Our goal is to store hundreds of millions of gallons of the unused treated water in the Cretaceous aquifer during periods of low demand," Spruill says. Aquifer storage and recovery is like money in the bank — it will be there for withdrawals with interest on hot summer days in the year 2010.

Spruill says suitable recharge sites have been identified. Stored in the right material, the water won't need additional treatment when it is tapped to meet future needs.

The timeline is ticking, and Spruill is hopeful that required state permits to recharge the aquifer will be issued by August or September 2001. Meanwhile, GUC is expanding its water treatment plant to treat 22.5 gallons per day by 2001.

MAKING OTHER PLANS

Other towns in the central coastal plain also are making plans to meet future demands. Kinston, in CUA-affected Lenoir County, is looking at using surface water from the Neuse River. Onslow County has moved part of its water system to the Castle Hayne Aquifer.

Saltwater intrusion of water supply aquifers in several coastal communities may require moving wells further inland. Currituck County officials are considering using reverse osmosis methods to treat brackish water intrusion of its water supply source. A pulp and paper operation in Virginia draws water from the same aquifer for its thirsty operation.

One proposal has an ironic twist: A Raleigh-based engineering firm is developing plans to tap millions of gallons of water discharged daily into the Pamlico River as a byproduct of PCS mining operations in Beaufort County. PCS pumps about 35 million gallons a day into the river, and has a state permit for 78 million gallons. PCS — once seen as a threat to water supplies — will make the water available for distribution to communities as far away as Goldsboro and Kinston.

SUSTAINABLE GOALS

Rayno says the long-term benefit of the statewide planning process is to identify regional water demands and develop sustainable supplies that make environmental and economic sense.

In addition to recommending Capacity Use Areas to address serious water issues for a region, DWR provides assistance to improve water use efficiency. The technical support is especially important for regions whose projected water use demand in 2000 exceeds 80 percent of supply. The division also encourages all water systems to develop a water shortage response plan and to engage in regional planning and management of water supplies.

"We need to understand that water is a limited resource — one with more demands than drinking supplies in coastal North Carolina," he says. ■

All local government water systems are required to update their water supply plans every five years.

The State Water Supply Plan is available online at the N.C. Division of Water Resources Website: www.ncwater.org.



TOP LEFT: An adult piping plover is found near an enclosure protecting a nest. TOP RIGHT: Joanna Harrington erects an enclosure at Cape Point. BOTTOM LEFT: Marcia Lyons and Stephen Hartsfield survey South Point for plover activity. BOTTOM RIGHT: Piping plover fledgling takes first flight along Hatteras Island.

A Fading Tune: Piping Plover Count Drops

By Katie Mosher • Photographs by Michael Halminski

North Carolina's coastline has a unique double-edged draw for the tiny piping plover.

Our string of barrier islands provides a winter home to dozens of the threatened shorebirds known for their distinctive flutelike call.

Then, come spring, other pairs of plovers — ones that likely wintered farther south — search out spots near North Carolina inlets to nest and hatch their young.

"We are the only state that has appreciable numbers of nesting and wintering pairs," says John Fussell, author

of *A Birder's Guide to Coastal North Carolina*.

And, during migratory periods, areas such as Hatteras Island may be critical "staging grounds" where the plovers forage for food, says Kevin Moody, staff biologist

Continued

with the U.S. Fish & Wildlife Service.

But whatever the season, the number of piping plovers continues to drop.

Fussell, for example, recalls 100 piping plovers wintering at the Rachel Carson Reserve when he started counting 30 years ago. Now his counts total only about a dozen.

And Marcia Lyons cites more recent years when Cape Hatteras National Seashore had 15 nesting pairs in a spring season. "We had four pairs in the park this year," says Lyons, a National Park Service field biologist. "We are losing breeding pairs."

A decade ago, Fussell says about 55 breeding pairs were counted in the state.

In 2000, the Fish & Wildlife Service counted only 24 pairs, 16 of those were in the Cape Lookout National Seashore. North Carolina accounted for only 13 fledglings — young birds that survive long enough to take their first flight.

At Cape Hatteras, only three chicks made it to the fledgling stage. At Cape Lookout, only eight fledglings were counted. At Lea Island, two fledglings were counted from one nesting pair. But at Pea Island and Huttuff, an island near Figure Eight, the pairs produced no fledglings.

The overall fledgling rate for North Carolina is 0.54 per nesting pair, well below the desired productivity rate of 1.5 fledglings per breeding pair.

NESTING GROUNDS

Fussell points to a loss of habitat. "They want the ends of the islands where the young can feed eventually," he says. "They have the most narrow habitat requirements of the ground-nesting waterbirds in the state."

Piping plovers prefer to nest in flat sandy areas near the inlets. Both the eggs and the hatchlings can blend well into the sand and small pebbles.

The small birds — measuring only 7 inches and weighing only 2 ounces as adults — may resemble sandpipers darting about between the tidelines. The Fish &

Visitors to the North Carolina coast should watch for piping plover nests from April, when the first nests are laid, to August, when the last chicks may be taking their initial flight.

The nests are built in depressions in the beach near the dunes.

Often they are lined with small pebbles or bits of shell.

Wildlife Service notes the adult's yellow-orange legs, black band across the forehead from eye to eye, and a black ring around the base of the neck. In the late 1800s and early 1900s, the population was decimated because the feathers were popular in the millinery industry.

The plovers that do nest in North Carolina are not banded for identification, because handling can injure the tiny birds.

"We don't know if they are the same birds," Lyons says. "My gut feeling is that they are returning," she says.

Moody agrees that the birds tend to remember locations of successful nests. "We believe they have a strong sense of fidelity," he says. These successful nests tend to be in areas restricted from development: state and national parks, wildlife refuges or estuarine research reserves.

The North Carolina sites are at the southern end of the coastal nesting range that extends north into Canada. Thus, heat could be a factor. As could a lack of appropriate insects and invertebrates that are plovers' main source of food.

Then there are the predators — including natural predators such as raccoons, mink or gulls. But the seashores are also home to countless feral cats, so many that the park service sets traps to humanely catch the cats and give them to local animal shelters.

And it may take only seconds for a dog running off-leash to disturb or destroy nests while the dog's owner is jogging nearby or absorbed in beachcombing.

Visitors to the North Carolina coast should watch for piping plover nests from April, when the first nests are laid, to

August, when the last chicks may be taking their initial flight. The nests are built in depressions in the beach near the dunes. Often they are lined with small pebbles or bits of shell.

Park staff, the Fish & Wildlife Service and local volunteers monitor areas known for past nests. Once a new nest is identified, an "exclosure" fence is constructed to keep predators — birds and mammals — away from the eggs. But, Lyons adds, the exclosures sometimes draw curious humans, who may damage important habitat near the fencing.

TAKING FLIGHT

Piping plovers take their parenting duties seriously. Both male and female watch fiercely over the nest eggs and later, the downy chicks.

The eggs are minded for about 25 days. The hatchlings have about another three to four weeks before they take flight.

While the public is told to keep a distance from the piping plovers, photographer Michael Halmanski has worked with park service staff to monitor the nesting patterns along the Outer Banks.

There is no instant gratification in his work — catching the birds on film is a challenge. "You need to keep your distance. They are so small," he says.

He recalls visiting one nest where the hatchlings had quickly grown and were ready for flight. "Of course the young birds are about the same size as the adults," he says.

The birds were fairly active — even approaching as he kept still in one spot.

"I saw a young one with an adult and it was stretching its wings," he says, recalling the astonishing moment. "You could see it coming. The chick stretched its wings out. It flew 40 or 50 feet, and we were ecstatic."

He caught that flight, and will continue to work with the park service on the project. "Every time I go out to visit the sites, I don't know what to expect," he says. ■

Hope for Migratory Sea Birds

By Cynthia
Henderson Vega

If, as Emily Dickinson wrote, “Hope is the thing with feathers,” then migratory birds may represent the ultimate hope. Heeding nature’s cyclical urging they take flight, sometimes traveling thousands of miles despite myriad natural and man-made adversities.

For sea birds, these adversities include a particular danger — entanglement in fishing nets. The problem is significant, according to Walker Golder, ornithologist with the National Audubon Society in Wilmington. Just how many birds are affected in North Carolina is unknown, he says, because of lack of research here.

But that could be changing thanks to the efforts of a commercial fisher and the N.C. Fishery Resource Grant Program (FRG). A few years ago Tommy Rose saw a dramatic increase in birds killed in his nets while fishing for shad in North Carolina’s northern coastal region. His wife, Donna Rose, says a lot of local fishers talked about having the same problem. “The guys would be heart-broken,” she says, at finding so many birds in their nets.

The Roses’ concern resulted in FRG funding to study bird bycatch during the shad season from January to mid-April, 2000. Disruption from Hurricane Floyd may have skewed those findings, so FRG awarded the Roses a second grant to cover next year’s shad season as well.



Fishing nets often entangle sea birds, such as this Forster's tern.

Photo by Walker Golder, Audubon Society

The Roses want to see if submerged nets will catch fewer birds than floating nets. Donna Rose says the study also might show peak times and conditions for fishing when birds would less likely be caught.

Doug Forsell, fishery and wildlife biologist for the U.S. Fish & Wildlife Service, Chesapeake Bay, found in a mid-Atlantic study that more than 2,000 birds were caught in gill nets from February through April 1998. Most (68 percent) were red-throated loons, followed by common loons (21 percent). Other birds included northern gannets, cormorants and red-breasted merganzers.

Forsell says one problem is that birds begin their return northward as water warms, and fish follow the warm water. The coincidence puts fishing nets and birds in the same place at the same time.

Lesser and greater scaup — ducks whose winter stays in Carolina coastal waters coincide with shad fishing season — are a declining species. While many

scientists look for contaminants as a possible cause, Forsell says the role of fishing nets should also be studied. Scaup can be caught in nets when they dive for grasses and shellfish.

Fish caught in nets may lure other birds. Merganzers race horizontally underwater in pursuit of fish — sometimes straight into fishing nets. Pelicans try to pull fish out of nets, Golder says, and can get heads or wings caught or even become snagged by bands placed on their legs for scientific studies.

Loons are a particular concern, says Forsell. With legs set far back on a long, goose-sized body, the loon is almost comically awkward on land but is an expert diver — therefore vulnerable to fishing nets.

Further studies might show ways to minimize that vulnerability. But ultimately, hope for migratory birds may come from those who use the waterways, recognize problems and work to find solutions. ☐



Sand Tiger Takes Photo Honors

Joe Poe of Durham started taking underwater pictures about 15 years ago.

He was so excited by the scenes during his diving trips, that he wanted to share the images with his friends and family.

This year, Poe's eye for underwater scenes earned him a top honor in the regional scenes category of the SEAS Scuba Expo underwater photography contest.

His image — of a sand tiger shark that is surrounded by bait fish — was taken at the scene of the wreck of the *Manuela*. A German U-boat sunk the 400-foot freighter in 1942.

The site is about 40 miles out of Beaufort's harbor, about 140 to 160 feet deep.

"We have been to this particular wreck several times," he says of the *Manuela*, which is deeper than many of the wrecks off the North Carolina coast.

"It is very broken up — spread over a football field size. The stern and bow are upright. The hull is upside down," he says.

Shutterbugs may be interested in the image details: Taken at a depth of approximately 155 feet with a Canon A2, in a Delphinus housing, with an Ikelite Ai strobe on full power (100 watts), and a 28-105mm Canon lens set at 28mm, at 1/60 sec. at f5.6, with Kodak E100VS film.

— K.M.

Goshen's Land

By David Cecelski

The News & Observer/Chris Seward

*You shall live in the region of Goshen
and be near me — you, your children
and grandchildren, your flocks and
herds, and all you have.*

— Genesis 45:10

As I drive east on Highway 58, the last landmark before the community of Goshen is the E. E. Bell farm. A long avenue of oaks and cedars veils an antebellum manor house with classical revival columns. Now on the National Register of Historic Places, the 2,000-acre cotton plantation once belonged to James C. Bryan, Jones County's largest planter. The main house is best known for having a crystal chandelier that once hung in the Confederate White House in Richmond, Virginia. The farm's cotton fields crowd Goshen against the Trent River and a little stream called Goshen Branch.

People in Goshen invited me there as a historian because the town of Pollocksville, a mile east, intended to build its sewage-treatment plant in this African American farming community. The sewage plant would spray its sludge only a few feet away from the Goshen cemetery and would take some of the last black-owned farmland in Jones County. Goshen was also one of the black communities settled immediately after the Civil War. The more famous town of Princeville, 70 miles north of Goshen, was the first incorporated African American town in the United States, but Goshen and a number of other, mostly



C o n t i n u e d

Hattie Brown learned Goshen history from her grandmother and is determined to keep the story alive.

disappearing rural black communities, were founded in the same time period. Goshen's residents believed their community deserved historic recognition and saw the building of the sewage plant as "an act of desecration," as one lady there told me. They also feared that the waste odors and runoff would pollute their forests and streams.

When I travel through the small towns and remote byways of tidewater North Carolina, I see a growing number of communities like Goshen that seem to be in the way of "progress." As more and more people move to the Carolina coast, and as growing numbers of tourists visit our beaches, many older, usually poor communities are threatened by the construction of sewage plants, highways, bridges, and waste-disposal sites. No place seems sacred. And to me, as a historian, many of these developments seem bent on erasing the past.

Goshen citizens hoped that if I could help them document the historical significance of their community, they might be able to pressure Pollocksville's leaders into not building the sewage plant there. I knew this would not be easy.

When I drove the dirt road to pick up Hattie Brown at her farmhouse, I already knew that finding historical documents on the African American past was exceedingly difficult.

On my way to Goshen, I had stopped at the North Carolina State Archives in Raleigh to search for written records on the community's past. I had also paused to ransack the Jones County Courthouse in Trenton. I had found a few relevant deeds, an old list of local slaves, and a few other documents, but not much. I had no idea how much I would learn in Goshen — not just about coastal history, but about the meaning of history and what is worth preserving.

In a pine grove by the branch, Hattie Brown and I walked among Goshen's dead. A soft-spoken 67-year-old, she recalled all the departed, whether buried in unmarked graves or under marble headstones. She had at least a few words for every soul. I listened while she wove together the threads of Goshen's past for me.

Hattie Brown learned Goshen's history from her grandmother Luvenia Smith Loftin. A midwife and lay doctor, Luvenia forbade her descendants to forget Goshen's past. What Hattie Brown told me, Luvenia had taught her.

Born a slave in 1848, Luvenia grew up on Richard Oldfield's plantation on the White Oak River, about 10 miles south of Goshen. Her father, Luke Smith, rebelled against the wealthy cotton planter. He secretly gardened in the nearby woods. He taught Luvenia to read by slipping books from Oldfield's library. He led clandestine prayer meetings. He also ran away many times. Luvenia saw him maimed with a bullwhip yet still disappear back into the woods.

In 1863, after Union troops drove Confederate forces out of most coastal towns, Luke Smith and his wife, Melissa, led their children to freedom. To reach Union-occupied New Bern, they crossed two rivers and the Lakes Pocosin — now part of Croatan National Forest. It was a wilderness crawling with cottonmouths and alligators. Fourteen-year-old Luvenia barely kept up and nearly drowned fording the Trent River.

Luvenia later married William Loftin, a former slave from Lenoir County. They sharecropped at first. But in the 1870s, they joined the Jordans, the Bests, and other Loftins in purchasing a remote, swampy woodland called "the Goshen tract." Wild plums, not pines, shaded the graveyard in those days.

Together, the families cleared the land by hand, grubbing enough earth for cotton, corn, and sweet potato fields. They raised hogs. They mortgaged everything to buy seed and a mule. A single crop failure could have left them homeless.

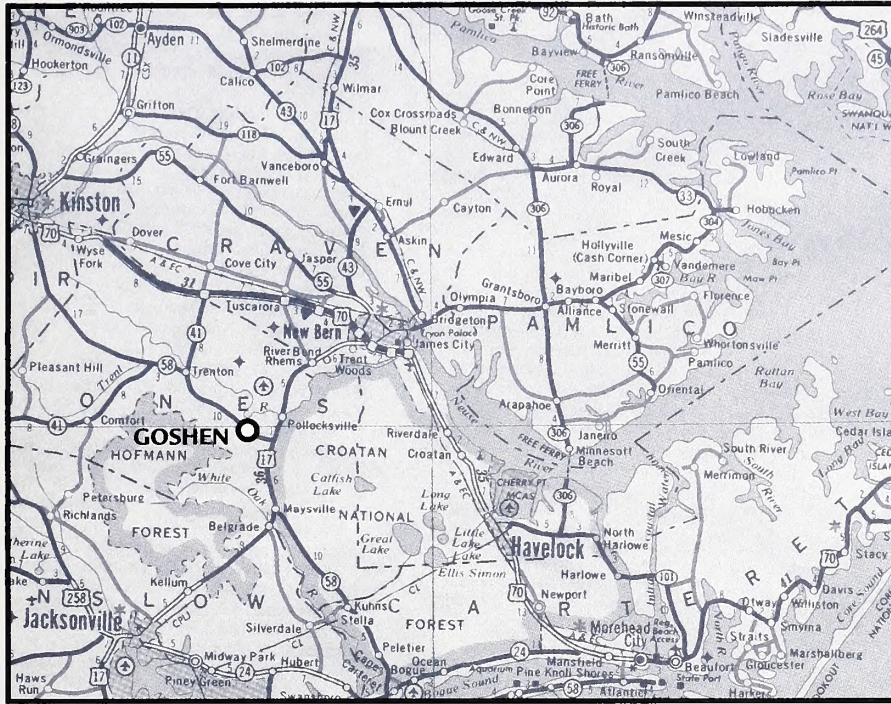
Few locales posed more dangers to black landowners than Jones County. During Reconstruction, the Ku Klux Klan terrorized the county's black majority. Years later, the county's most famous son, future U.S. Sen. Fumifold Simmons, led the state's white-supremacy movement, which took the right to vote away from black citizens across North Carolina. I had noticed that a portrait of Sen. Simmons still graced the main entrance to the Jones County Courthouse.

When I travel through the small towns and remote byways of tidewater North Carolina, I see a growing number of communities like Goshen that seem to be in the way of "progress." As more and more people move to the Carolina coast, and as growing numbers of tourists visit our beaches, many older, usually poor communities are threatened by the construction of sewage plants, highways, bridges, and waste-disposal sites. No place seems sacred. And to me, as a historian, many of these developments seem bent on erasing the past.

Amid that racial strife, Goshen was a rare sanctuary. Reached only by an old Indian trail, the community was very secluded. Luvenia freely roamed the forest for her herbal cures. The children played without inhibition. And at Christmas, the people wandered by every home to share good food and glad tidings. Everybody knew everybody, and the community looked out for its own. Only when walking past Pollocksville to the Garnett Heights school did Goshen's children suffer racial taunts.

After Luvenia Loftin's death in 1941, her descendants struggled to hold on to Goshen. Like all small farmers, they suffered from bad weather, feeble mules, and low prices. But Jim Crow also prohibited them from challenging corrupt merchants and produce buyers. And the county sheriff showed little mercy to black farmers delinquent in their tax payments. Hattie Brown remembered all too well when her cousin Laura's family was dispossessed; the family stayed for years in a drafty tobacco barn, and Laura soon died of pneumonia.

We walked past small plastic signs marking the evicted family's graves. "They lived with so many heartaches," Hattie Brown sighed.



To hold on to the land, Goshen's citizens also held jobs away from the farm. The men traveled to distant sawmills and logging jobs. The women and children picked tobacco on farms owned by white families. In spring, they harvested strawberries a hundred miles away and rushed home on weekends to tend their own farms.

Holding a family together was a feat. For years after their father died, Hattie Brown and her sister Minzelle Dillahunt ran the Loftin farm by themselves. They plowed fields and fought off merchants who tried to take advantage of two women doing "men's work." Their brothers, Lucius Jr. and William, staved off foreclosure by sending military paychecks home. Sister Leora Murray, a Philadelphia nurse, helped out when she could.

Black-owned farmland dwindled away elsewhere in Jones County, and indeed throughout the coastal plain. When blacktop replaced the Indian trail in 1952, Goshen's citizens began to commute to domestic and factory jobs in other counties; Jones County itself never offered more than farm work, except for little cut-and-sew factories that went

in and out of business every few years. Hattie Brown's cousin Julia was like many. For decades, she cooked for a white family in Kinston, 20 miles away. She came home only on weekends, but she kept her land in Goshen nonetheless.

Then the drowning of Minzelle's young son in 1956, followed by a great flood in 1957, nearly shattered the community.

Yet Goshen has somehow survived. Today, African Americans comprise 43 percent of Jones County's population, yet they own less than 3 percent of the land. More than half the county's farmers — landowners, tenants, and sharecroppers — were African Americans two generations ago. Now, only a handful of black farmers till the land, and most only raise a few hogs or tend a few acres.

In Jones County, as in many parts of eastern North Carolina, landlessness has led to widespread poverty and hopelessness. Hordes of other black farm people have moved to cities. In the old days, they moved to Brooklyn, New Jersey and Baltimore. Nowadays, they usually do not have to go as far to find opportunity, but the result is the same back home: rural churches with

dwindling congregations, elderly people living alone, high rates of alcohol and drug abuse.

But in Goshen, land ownership has meant independence, strong roots, and an enduring closeness to the soil. Hattie Brown can look out her home's windows across cornfields and collard patches that have been in her family for generations. She can see the homes of nieces and nephews, brothers and cousins on the far side of those fields. And thanks to Goshen's deep roots, the children who leave home often do well. Goshen boasts teachers, lawyers, engineers, and scientists among its children. One of Hattie Brown's nieces I later met is Professor Elvira Williams, who teaches at North Carolina Agricultural and Technical State University in Greensboro. Professor Williams was one of the first African American physicists in the country.

All of this made me ponder the meaning of history and what merits historic recognition. As I got to know Goshen the day when Hattie Brown and I strolled through the cemetery and during later visits, I noticed that young Goshenites have been coming home more often recently. They have returned to join the struggle to save the community and preserve its cemetery and farmland. None of the old homes and local landmarks in Goshen are the sort that will be given protected status by the National Register for Historic Places, like the E. E. Bell farm up the road and the old Foscue Plantation house across the Trent River.

These young people in Goshen seem to know — or at least to intuit, as I did that autumn afternoon in Goshen's cemetery — that the real meaning of history has little to do with antique chandeliers and Doric columns. Hattie Brown and her neighbors taught me that other things are far more important: the collective experiences of a community and the stories passed from generation to generation by women like Luvenia Loftin and Hattie Brown. ■

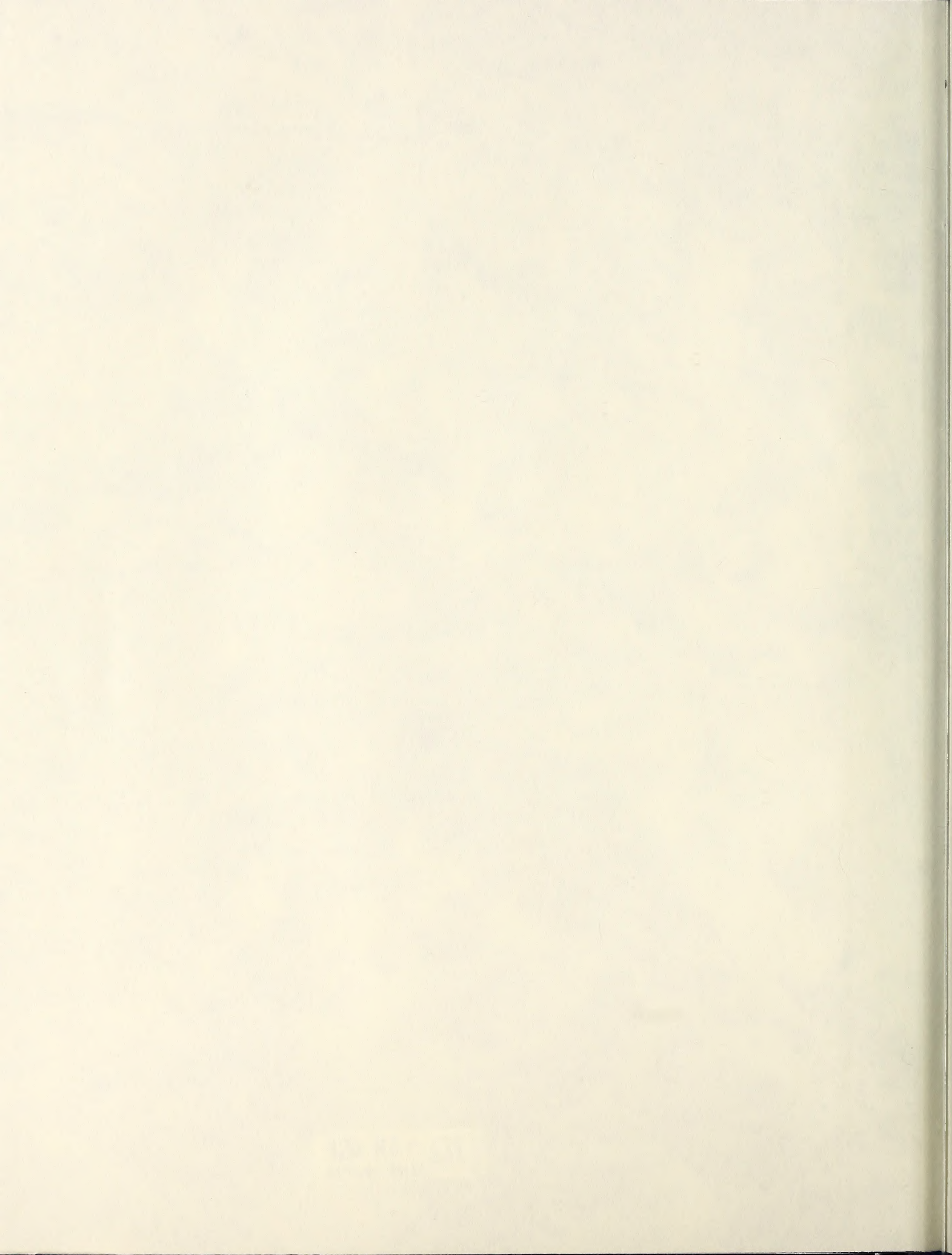
Included in A Historian's Coast: Adventures into the Tidewater Past, by David Cecelski; John F. Blair, publisher.

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